American Gas Journal

OCTOBER, 1958 | Only Magazine Edited Exclusively for the Gas Distribution Industry

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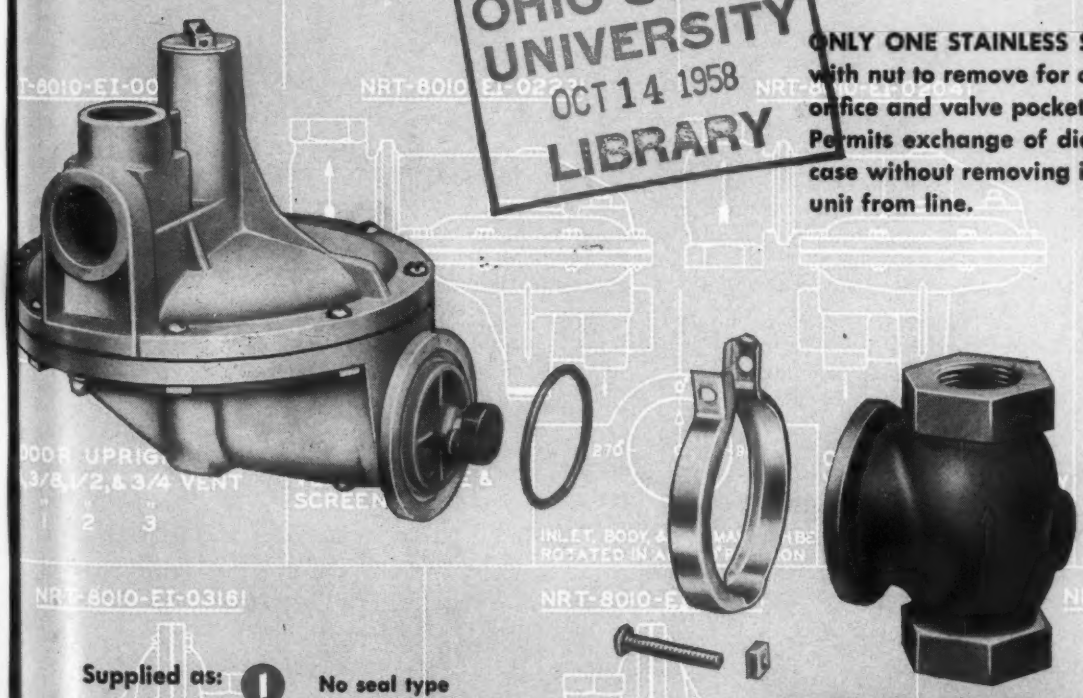

ONLY ONE STAINLESS SCREW with nut to remove for complete orifice and valve pocket. Permits exchange of diaphragm case without removing inlet unit from line.

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Established 1859

American Gas Journal ®

ONLY MAGAZINE EDITED EXCLUSIVELY FOR THE GAS DISTRIBUTION INDUSTRY

October, 1958 **100th Year of Publication** Vol. 185, No. 11

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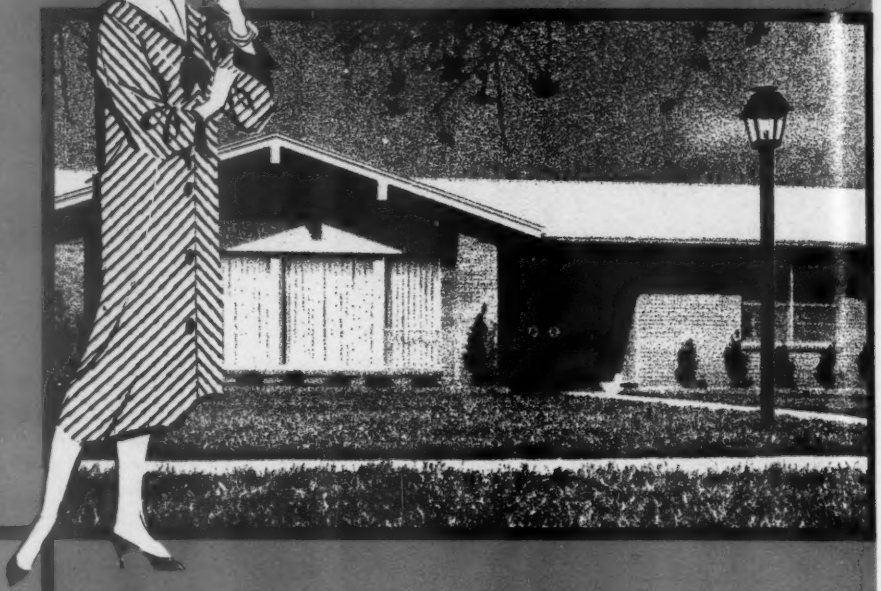
...the TILT-TOP



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American Gas Journal

Established July 1, 1859

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Printed in U.S.A.

Mcf

CATC Offshore Gas Developments. In the September MCF, it was reported that gas produced by the CATC group wasn't moving from off the coast of Cameron Parish, Louisiana, through Tennessee Gas Company's big new high-pressure underwater line. Subsequently, AGJ learned that gas is now moving through the line, although the question of price for the gas remains in litigation. The Third Circuit Court on August 27 denied a rehearing of its decision and a stay of mandate was requested by producers involved in the case, indicating an appeal will be made to the Supreme Court. On the same date, August 27, TGT filed a supplemental statement to the FPC, which said: "Applicant is presently receiving into its system gas from the CATC producers in accordance with the existing contracts with these producers pursuant to authorization granted by the Commission a G-11,046 and G-11,107. The CATC gas augments applicant's total gas supply and is not assigned or dedicated to any particular market or pipeline capacity increase. During 1959, it is anticipated that applicant will receive into its pipeline system approximately 150,000 Mcf of such gas per day."

Smaller size with bigger capacity gas air conditioning units will be on the market in the near future, reports A.G.A.'s Air Conditioning Promotion Committee. Seven manufacturers, reporting on present products and research for the future, note that new units will be more efficient and economical, quieter in operation, will cool and dehumidify more efficiently than other type units, will purify air by ridding it of odors and germs, and be available in sizes from 3-ton for residential use to thousands of tons for commercial and industrial installations.

Gas appliance sales in the second half of 1958 are expected to exceed those of the same period in 1957, and 1959 volume will show appreciable gains, reports Edward R. Martin, GAMA marketing and research director. In a new "general business outlook" report, Martin notes that manufacturers feel the trend will be moderately upward and gradually accelerated in the next 18 months. Optimism is based on such factors as expansion programs of the gas utilities, high level of housing construction, and greater purchaser consumption.

Florida will have natural gas service in 1959 as result of completion of financing on the 1500-mile pipeline system from Texas to the peninsular state. Check for over $52,000,000, the public financing part of the $185,000,000 program, was delivered to The Houston Corporation recently for its two pipeline subsidiary companies. Firm is also completing acquisition of gas distribution properties in Florida; will convert them to natural gas when its pipeline system is in operation.

Automatic gas water heaters with inputs of 200,000 Btu or less, meeting ASA code requirements and approved by A.G.A., have been recognized by Wisconsin's Industrial Commission in its newly revised boiler code. Previously, state required certain water heaters of more than 100,000 Btu input to meet requirements of the ASME Boiler and Pressure Vessel Code. The action was hailed by GAMA managing director Harold Massey, who expressed confidence that it would serve as an example for other states now considering boiler code revisions or interpretations. The ASME Boiler Code was not originally intended to cover today's automatic water heaters and the group recognized this fact in May 1958 when it excepted gas storage water heaters of 200,000 Btu input or less.

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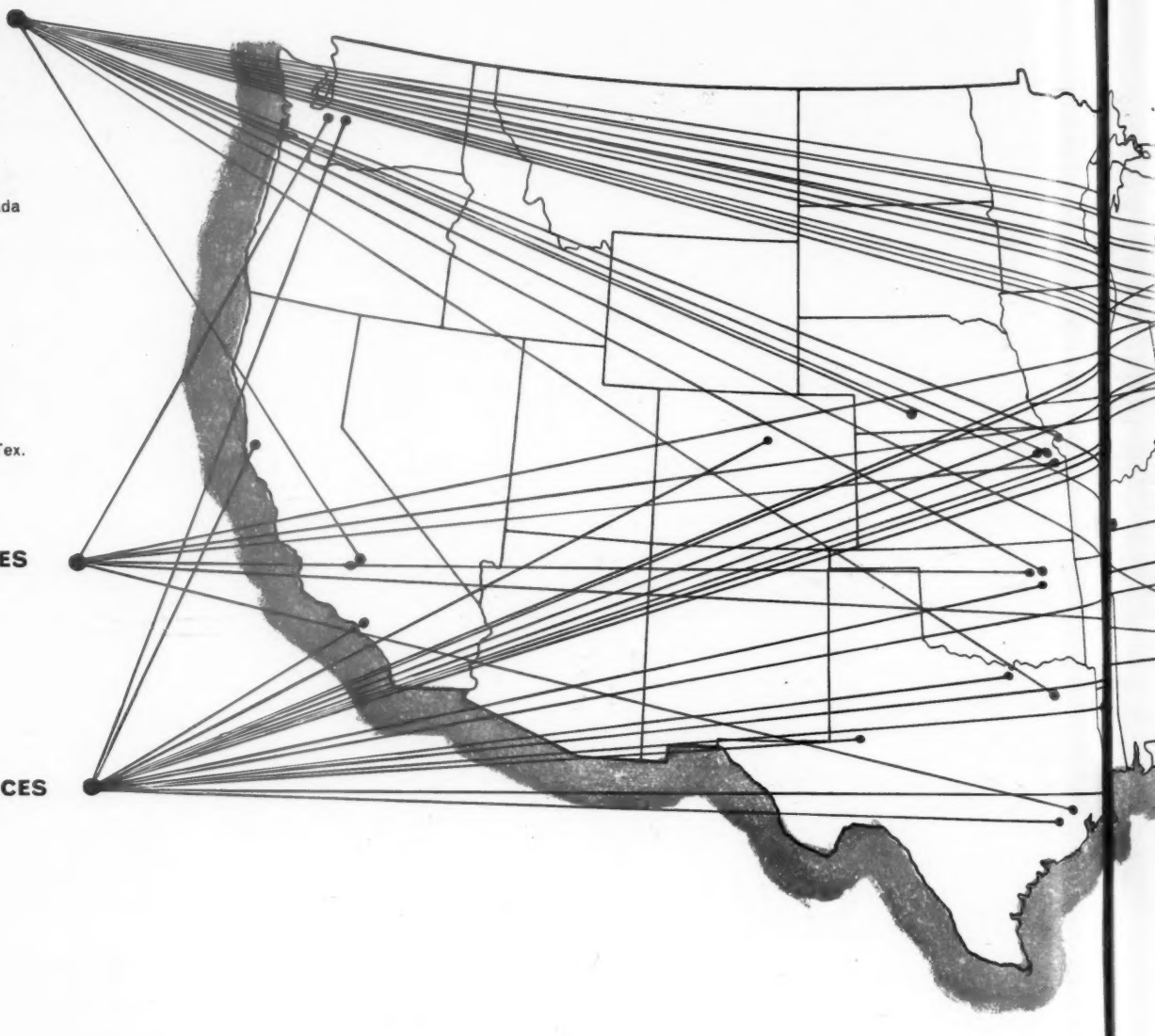

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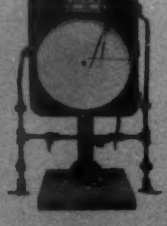

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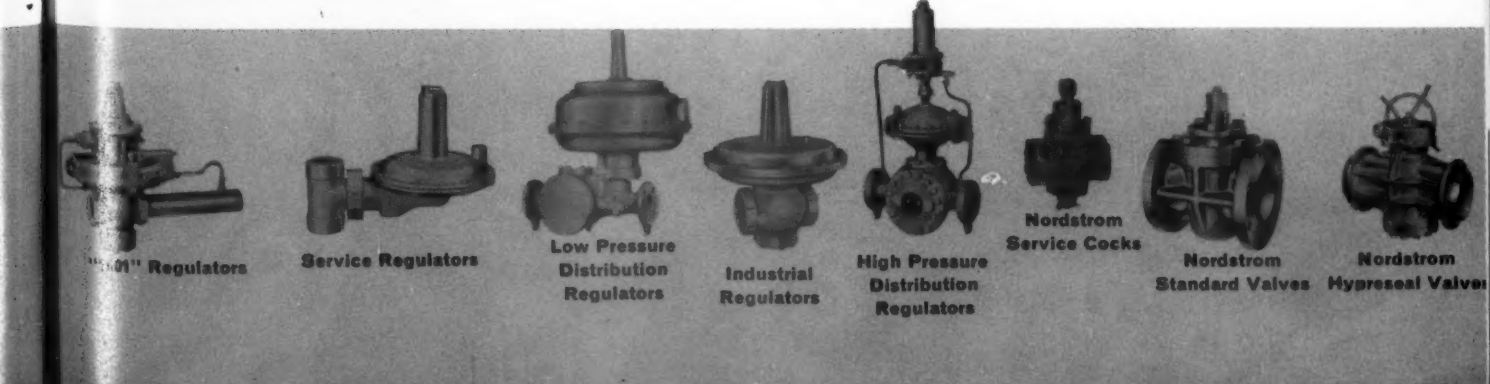

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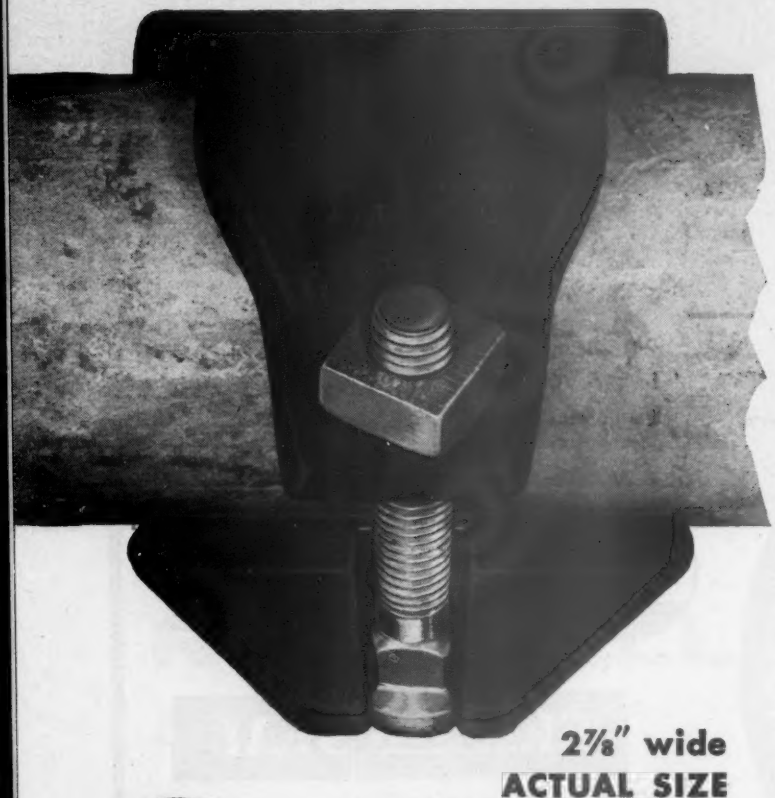

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Lug on gasket half is slotted

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SKINNER-SEAL JUNIOR EMERGENCY PIPE CLAMP

Coming Events

IN THE GAS DISTRIBUTION INDUSTRY

October

9 NEGA, customer service managers' group of operating division, Marlboro Country Club, Marlboro, Massachusetts.

9-10 National Noise Abatement Symposium, Hotel Sherman, Chicago, Illinois.

10 NEGA, heating group of C-H-I division, Publick House, Sturbridge, Massachusetts.

13-15 A.G.A., annual convention, Atlantic City, New Jersey.

15-16 Gas Measurement Institute, sponsored by University of Kansas and Southwest Kansas Petroleum Industry, National Guard Armory, Liberal, Kansas.

15-17 Wisconsin Utilities Association electric and gas sales operating convention, Hotel Schroeder, Milwaukee, Wisconsin.

17 NEGA, industrial group of C-H-I division, Sheraton-Biltmore, Providence, Rhode Island.

20-24 National Safety Council, Chicago, Illinois.

20-24 NACE, annual conference and exhibition, south central region, Roosevelt Hotel, New Orleans.

21-22 Purchasing Workshop Conference, Illinois Institute of Technology, Chicago, Illinois.

22 NEGA, street department supervisors' group of operating division, Bancroft Hotel, Worcester, Massachusetts.

22-24 Air Conditioning & Refrigeration Wholesalers, annual meeting, Sheraton-Palace Hotel, San Francisco, California.

23 A.G.A. Mid-West PR workshop, Hotel Sheraton-Martin, Sioux City, Iowa.

23 NEGA, home service group, Publick House, Sturbridge, Massachusetts.

23-25 National Society of Professional Engineers (Fall), St. Francis Hotel, San Francisco, California.

24 Oklahoma Utilities Association accounting conference, Burlingame Hotel, Bartlesville, Oklahoma.

29-30 Computer Applications Symposium, sponsored by Armour Research Foundation, Morrison Hotel, Chicago, Illinois.

30 NEGA operating division, Sheraton Kimball Hotel, Springfield, Massachusetts.

30-31 American Home Laundry Conference, Chase Hotel, St. Louis, Missouri.

31 NEGA accounting division, Statler Hilton Hotel, Hartford, Connecticut.

November

10-12 API convention, Palmer House Hotel, Chicago, Illinois.

17-19 National Fire Protection Association fall conference, Pittsburgh, Pennsylvania.

18-20 American Standards Association, Hotel Roosevelt, New York, New York.

19-21 Mid-West Gas Association, gas meter and service school and conference, Iowa State College, Ames, Iowa.

20 NEGA manufacturer - distributor division, Bancroft Hotel, Worcester, Massachusetts.

19-21 Mid-West Gas Association gas meter and service school and conference, Iowa State College, Ames, Iowa.

30-December 5 American Society of Mechanical Engineers, annual meeting, Statler Hotel, New York, New York.

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the industry's ultra-modern pipe mill

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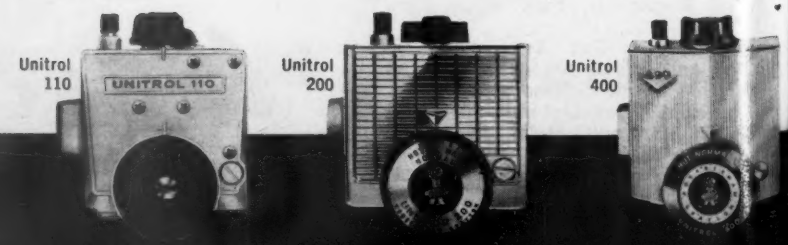
- Simplify assembly



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The smartest way to boost sales, the ultimate in appearance, dependability and efficiency . . . plus a new built-in pressure regulator.

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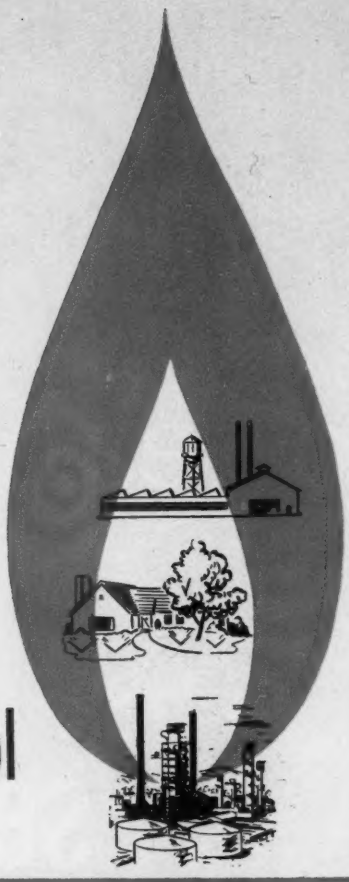

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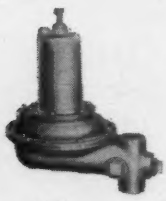

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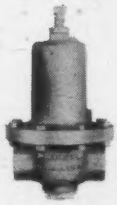
CBV—DIRECT



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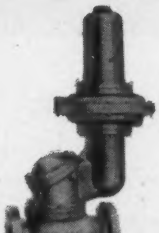
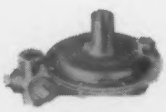


CBV—OFFSET

HPC



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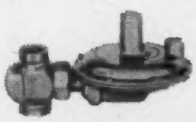

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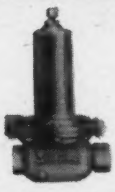

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MAKE GAS BEHAVE WITH RELIANCE—*THE MOST ECONOMICAL—IN TERMS OF SERVICE!*

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AMERICAN METER CO MEASUREMENT ENGINEERS

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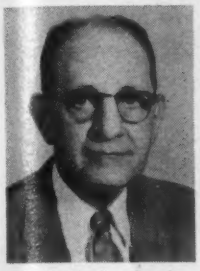
Men At Work

IN THE GAS DISTRIBUTION INDUSTRY

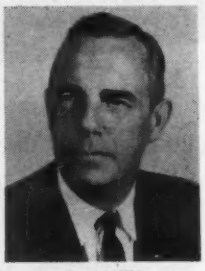
● Four new members have been elected to the board of directors of East Ohio Gas Company. Named were **George P. Binder,** chief engineer; **John S. McElwain,** general sales manager; **Charles E. Gallagher,** manager of distribution for the southern region; and **Thomas J. Noonan,** manager of distribution for the northern region. Appointments followed the retirement last month of board members **William G. Rogers,** chairman of the board, and **George W. Horsley,** senior vice president. Two new directorships were created to bring the total board membership to 10.



J. M. Rutherford

J. A. Bieber

W. J. Curnow



L. S. Williams

● **John M. Rutherford** and **John A. Bieber** have been elected vice presidents of Ohio Fuel Gas Company. Rutherford, former treasurer, has been elected vice president in charge of financing and accounting. Bieber is in charge of wholesale sales. **William J. Curnow** has been elected treasurer and **Luther S. Williams,** assistant treasurer.

● **John StJohn,** officer of Madison Gas and Electric Company for more than 50 years and president since 1940, has been elected chairman of the board. **Theron A. Brown,** former vice president and general manager, has been elected president and general manager, and director. **William A. McNamara,** formerly with the law firm of Rieser, Mathys, McNamara and Stafford, has been elected financial vice president and director.

● **Harold J. Merilees,** British Columbia Electric's public information manager, has been appointed executive assistant. He is succeeded by **Peter C. Woodward,** former director of public information in the company's Fraser Valley area.

● **Roy N. Dreiman,** assistant comptroller, Pacific Gas & Electric Company, has been elected first vice president of the San Francisco Control of the Controllers Institute of America.

● **Robert C. Smith, Jr.,** has been appointed commercial and industrial sales supervisor of Mystic Valley Gas Company succeeding **A. Nelson Parry,** who has resigned.

● **Walter D. Howell** has been named manager of commercial, industrial, and agricultural sales for Pacific Gas and Electric company succeeding **J. H. Gumz** who retired recently. Howell was formerly manager of agricultural sales and special accounts.

● Peoples Gas Light & Coke Company has announced the following personnel changes: **William Meale** has been promoted to engineer, engineering department. **Herbert L. Morin** has been promoted to supervisor, meter readers, meter reading department.

● Recent personnel changes in the engineering department supervisory staff of Southern California Gas Co. include: appointment of **C. T. Schweitzer** to a second position of design and construction engineer. He was formerly supervisor of engineering standards. During the extended illness of **E. E. Ellis,** Schweitzer assumes full responsibilities of the design and construction position. In another change, **J. T. Wootan** reports to **S. A. Bradfield,** manager of engineering. Other changes include: Supervisor of design engineers **J. W. Pierce** becomes supervisor of engineering standards; Kern Division engineer **F. N. Goodrich** becomes supervisor of design engineers; Kern Division superintendent of transmission, **A. S. Olson,** becomes superintendent of transmission and engineering in the Kern Division.

● **David M. Heskett** has been appointed superintendent of the gas department of Tucson Gas, Electric Light and Power Company succeeding **C. H. Webber** who retired recently.

● **Aristotle A. Copetas** has been appointed manager of system gas supply of Consolidated Natural Gas Company succeeding **J. J. Schmidt** who was recently elected vice president of Hope Natural Gas Company. Copetas will make his headquarters in Pittsburgh where two subsidiary companies, New York State Natural Gas Corporation and The Peoples Natural Gas Company, are located.

A. A. Copetas

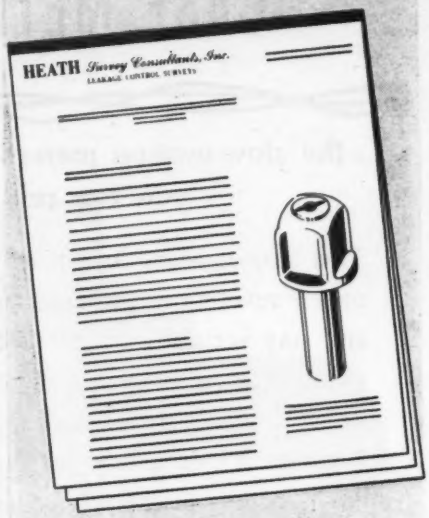
D. L. Sedgwick

● **Donald L. Sedgwick** has been promoted to vice president of Northern Natural Gas Company. He is general manager for Peoples Natural Gas Division of Northern.

John J. Delaney

J. J. Delaney, 62, general manager of Reliance Regulator Division of American Meter Company, died June 10 after a brief illness. "Jack" Delaney served with Reliance Regulator Division for 28 years and had been general manager since 1942. He began his career with Peoples Natural Gas Company in 1909, and joined Reliance in 1930.

NOW — safe, automatic leakage control tests in paved areas with the new HEATH A-T-I Unit



Bulletin H-2 describes the Auto Test Insert *(pat. pending)* which

- Provides more thorough "downtown" survey in minimum time
- Permits instant testing from a vehicle
- Makes testing SAFER for test operators, SAFER for underground plant
- Lasts "forever" because it's made of cast iron and bronze
- Automatically re-seals itself when probe is withdrawn
- Can be used in all climates

Bulletin H-2 describes the A-T-I Unit, contains cut-away installation drawings showing how it is used. For your copy, write today:

HEATH
Survey Consultants, Inc.
575 Washington Street
Wellesley 81, Massachusetts

The new Superior ALUMINUM CASE METERS

. . . the slow-motion meters you can rely on longer

This slow-motion, long-lived meter operates at only 7 revolutions per cubic foot to reduce wear and stay accurate longer. And its simple, horizontal seam construction gives fewer chances for leaks . . . makes maintenance quick and simple. Whether it's adjusting the tangent through the handy access in the top . . . removing the top to grind the valve seat . . . or lifting out the valve table with the entire inner movement to replace the diaphragm, simply loosening a few screws makes everything accessible.

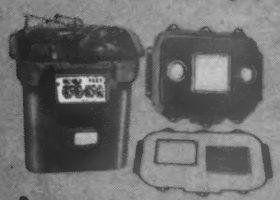
Get full details. Send for bulletin 1150.

This modern meter exploits all the time-tested advances in meter technology *plus* the latest manufacturing techniques of Superior's new plant.

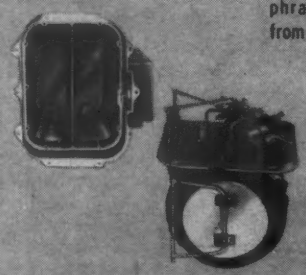
SUPERIOR METER COMPANY, INC.
19 West 50th Street, New York 20, N. Y.
A SUBSIDIARY OF NEPTUNE METER COMPANY

neptune

1. Simple, horizontal seam . . . eliminates leakage . . . easier maintenance
2. Easily accessible table . . . just remove the screws holding top



3. Meter top removable without taking off index box
4. Valve seat readily accessible for grinding when top is removed
5. Slow movement; only 7 revolutions per cubic foot
6. Seam gasket stays resilient . . . cork and Buna-N composition
7. Valve table lifts out with entire mechanism



8. Heavy-duty, sintered bronze bearings oil-impregnated for life
9. Flag arrangement gives arm smoother operation and longer life
10. Accurately controlled diaphragm . . . no inaccuracies from deflection
11. Cupped handling lids permit easy and safe carrying
12. Handy access for tangent adjustment and calibration
13. Broad base for solid stacking . . . designed for conveyorized handling
14. Index removable without removing meter

In 250 cfh and 340 cfh sizes to meet most domestic requirements.

MUELLER®
500 pound
LubOseal®

stop — Ductile Iron for working pressures to 500 p.s.i.!

Form No. G-8913

Printed in U.S.A.

Ground key surfaces and Quad-Rings

Provide Pressure Seal . . .

GROUND AND LAPPED BODY AND KEY

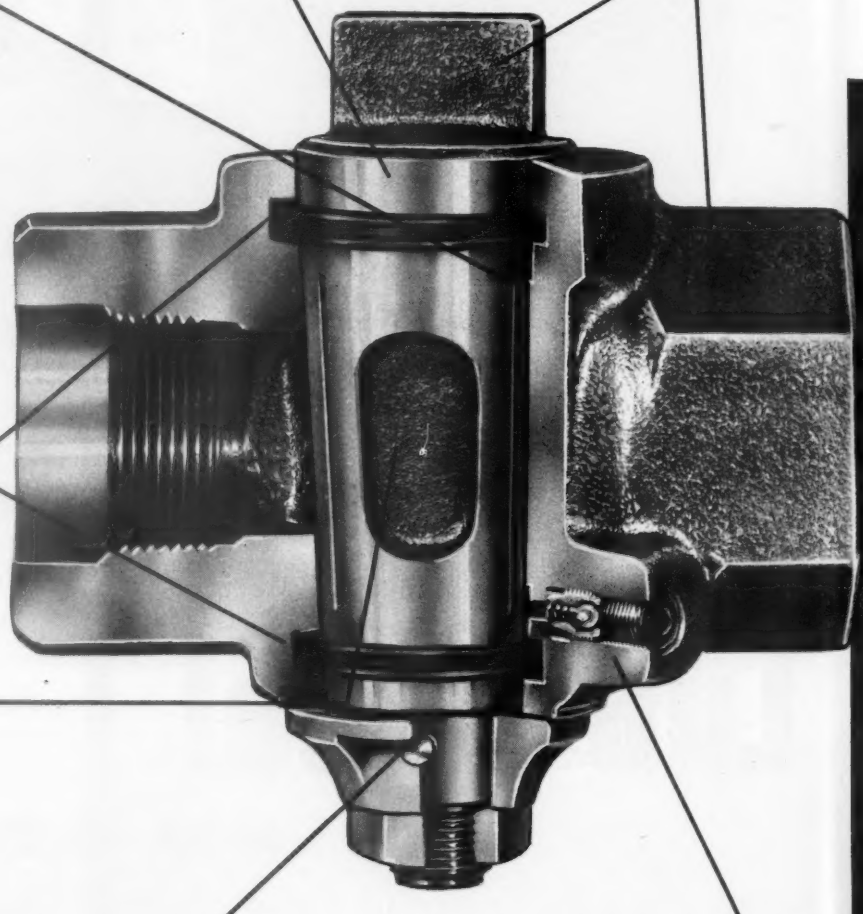
Ductile iron provides excellent machining qualities, therefore the body and key can be accurately machined and individually ground and lapped for a precision, gas-tight fit.

DUCTILE IRON BODY AND KEY

The corrosion resistance of cast iron with the strength, impact and fatigue resistance of steel—all these advantages are incorporated in the 500 pound LubOseal Ductile Iron Stop. The body threads are recessed for added strength and rigidity. The body ports are tapered to meet the straightway in the key, providing smooth flow and additional strength.

LUBRICATED KEY FOR EASY TURNING

The lubrication system of LubOseal Stops maintains a proper grease film on the seating surfaces, assuring easy turning and pressure tightness. It is not primarily intended to provide a gas seal by grease in grooves under pressure. Four vertical grooves in the key distribute the lubricant over the ground and lapped surfaces each time the stop is operated. The quad-rings in the circular grooves and the entire seating surface between these grooves are fully lubricated. In any position other than fully "opened" or fully "closed", the vertical grooves are disconnected from the circular reservoir grooves, preventing the line pressure from forcing the grease out of the greasing system.



QUAD-RING SEALS

The top and bottom of the key are positively sealed by quad-rings located in grooves in the body. The quad-rings also pressurize the lubricant—deflecting as the lubricant reservoir is filled and expanding to keep pressure on the lubricant as it is used.

FALSE PORTS

False ports in the key and body line up with the true body and key ports respectively when in the closed position. This prevents grit or dust from adhering to the seating surfaces of the key and later damaging them. The seating contact is reduced to only those areas where it is useful, resulting in an easier turning stop.

TAMPER-PROOF

A heavy bronze washer is secured to the lower end of the stem by a drive-lock pin in a blind hole, thereby permanently maintaining the perfect adjustment between the key and body. The stop is operable with the stem nut removed or with the nut over-tightened to the point of stripping the threads before the stem breaks, providing an additional safety feature.

TRIPLE-SEALED RE-LUBRICATING PORT

The grease port is located so that a ground and lapped seating surface is between it and the main gas port, preventing any leakage. A spring loaded, ball-check grease fitting provides a second seal. The socket head pipe plug forces grease through the grease fitting into the entire lubricating system and provides a final and permanent seal!

MUELLER CO.

DECATUR, ILL.

why use Ductile Iron?

Carbon exists in gray cast iron in the form of graphite flakes, (Figure 1). These flakes vary in size and length and at times intersect each other disrupting the continuity of the base metal. It is this arrangement of the graphite in the form of flakes that gives gray cast iron its brittle characteristics.

Ductile Iron (also called Nodular Iron or Spheroidal-Graphite Iron) is a type of cast iron in which the graphitic carbon is substantially in balls or in spheroidal form (Figure 2). The base metal is much more nearly continuous, therefore, the physical properties of Ductile Iron are more nearly that of steel or malleable iron.

The spherical graphite, which appears in the casting when poured, is formed by the action of small amounts of magnesium or cerium in the melt. Sound pressure-tight castings can be obtained even in the complex shapes and uneven sections of stop bodies.

The corrosion resistance of Ductile Iron is equal to, or better than, regular gray iron.

Both the body and key of Mueller 500 pound LubOseal Ductile Iron Stops are made in compliance with ASTM Specification A339-55; Grade 60-45-10.

MINIMUM PHYSICAL REQUIREMENTS

Tensile Strength	60,000 p.s.i.
Yield Strength	45,000 p.s.i.
Elongation in 2 in.	10 per cent

*Fig. 1. Gray Cast Iron. Failure could occur here.

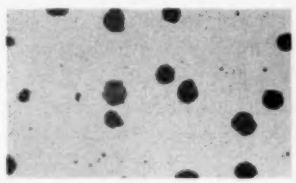
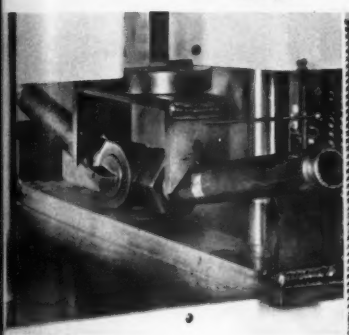


*Fig. 2. Ductile Iron.

*Fig. 3. Ductile Iron can be bent or twisted.

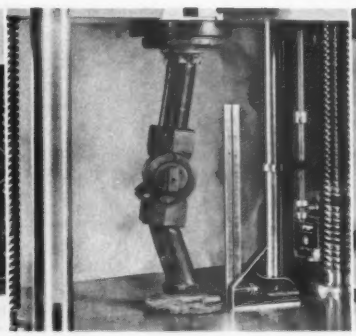
*Photos courtesy International Nickel Company.

Rugged Tests Prove Durability!



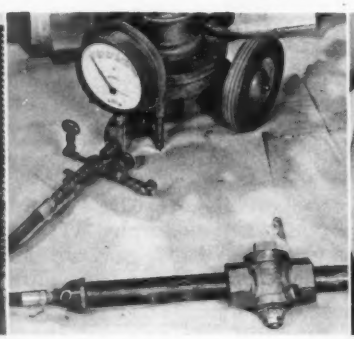
Bending Test—Stop with Schedule 80 Steel Pipe. Bending Load of 4,000 pounds applied. Bending moment of 18,000 inch pounds.

Results—Pipe was badly distorted. Stop position bent 2.83 inches out of line. Stop intact. Retested at 500 p.s.i. air pressure under water in closed position. No leaks at top or bottom of key or through the port.



Compression Test—Stop with Schedule 40 Steel Pipe. Compression load of 26,200 pounds.

Results—Pipe was badly distorted and threads on the pipe were stripped. Stop position was bent 1.30 inches out of line. Stop was then retested to 500 p.s.i. air pressure under water—absolutely tight in closed position with no leaks at either top or bottom of the key.

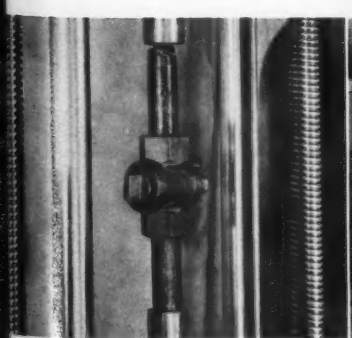


High Pressure Destruction Test—Stop in closed piping system. Tested under extreme pressure.

Results—Reducing coupling broke at 9,500 p.s.i. Stop did not leak at top or bottom of key under 9,500 p.s.i. Stop was then retested with 500 p.s.i. air pressure under water in the closed position with no leaks at either top or bottom of the key and with negligible port leakage. Stop shows high safety factor.

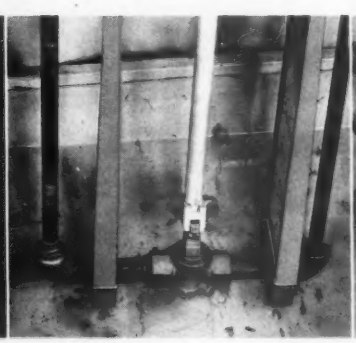
Torsion Test—Stop with Schedule 40 Pipe. The pipe on one side of the stop was securely fastened in a pipe vise. Torque was applied to the free end of pipe at opposite side of the stop.

Results — Excessive tightening caused piping to fail with no damage to stop. Stop was then retested with 500 p.s.i. air pressure under water. Absolutely tight in the closed position with no leaks at either top or bottom of the key.



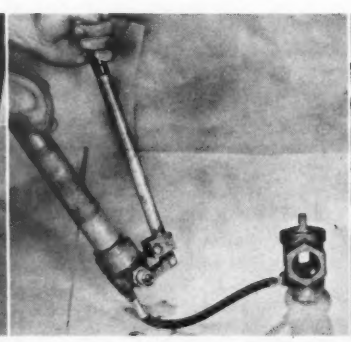
Tensile Test—Stop with Schedule 40 Steel Pipe. Tensile Pull of 22,150 pounds.

Results—Pipe stretched to breaking point in threaded section. Stop was then retested with 500 p.s.i. air pressure under water; absolutely tight in the closed position with no leaks at either top or bottom of the key.

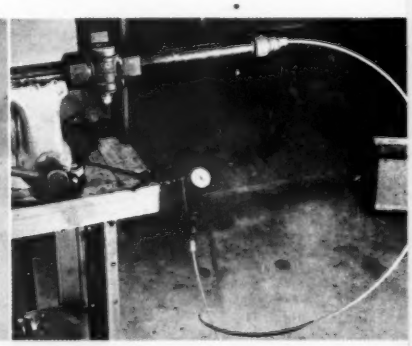


Cycling Test—Stop was fully opened and fully closed under air pressure of 350 p.s.i. with stop submerged in water for 6500 cycles without leakage at either top or bottom of the key.

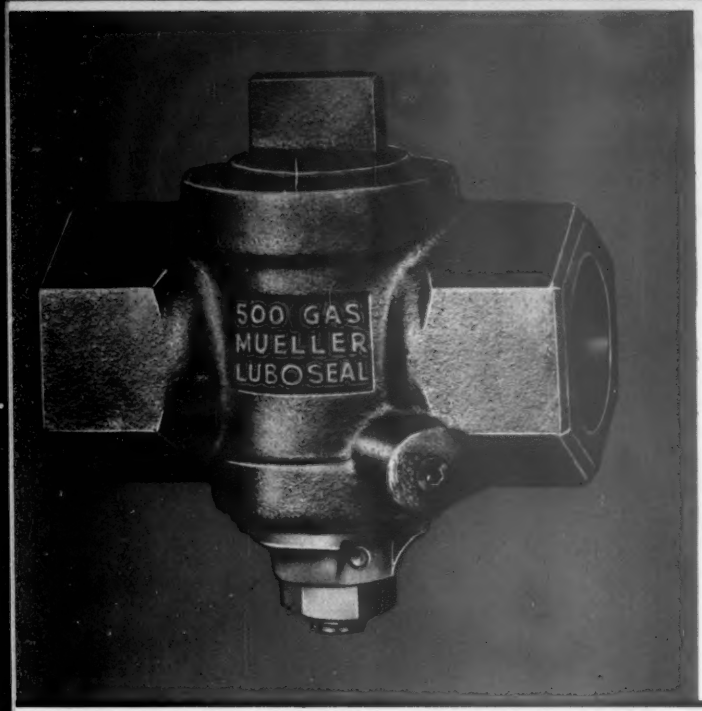
Results—After 6,500 cycles, stop was regreased and re-tested under water. There were no leaks at top or bottom of the key or through the port with the stop closed.



Regreasing Stop—Open Position—Stop was regreased in open position with excessive grease pressure applied. No grease entered the port.



Regreasing Stop in Line—Stop can be regreased in the line at rated pressure of 500 p.s.i. There is no loss of grease due to line pressure. (See Page 2.) Grease plug was removed under pressure. Results: No loss of grease through the relubrication port.



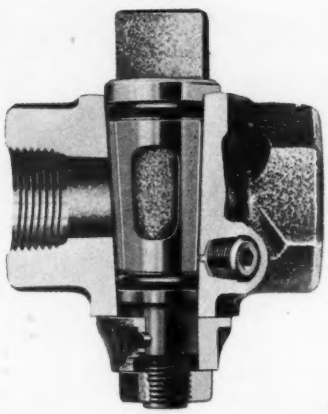
Standardize on LubOseal®

for high working pressures

H-11180 Solid Head
500 pound LubOseal Stop—
Ductile Iron
Sizes: ¾", 1", 1¼", 1½" and 2"
Inlet: Recessed Inside I.P. Thread
Outlet: Recessed Inside I.P. Thread
Finish: Black
Working pressure to 500 p.s.i.

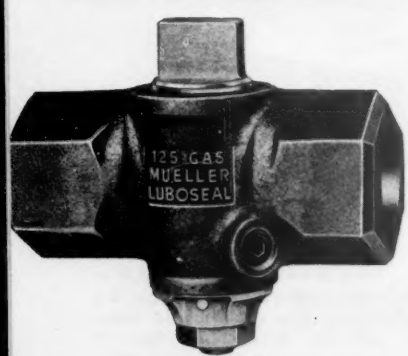
125 pound LubOseal

The Mueller 125 pound LubOseal Stop is iron body with bronze key. "O" rings at top and bottom of key provide a permanent seal against gas leakage to the atmosphere. The bronze key and iron body are ground and lapped to exacting tolerances to prevent leakage around the port. Key is re-lubricated through an independent port in the body—vertical grooves in key distribute lubricant over ground key surfaces each time stop is operated—lubricant is sealed in by "O" rings and ground key surfaces—offers absolute assurance of easy turning. Steel drive lock pin, driven in a blind hole through washer into key, makes stop tamperproof—not only holds key in body but also maintains key adjustment for proper and safe operation even if nut is accidentally removed by an unauthorized person.



H-11175 Lock Wing
125 pound LubOseal Stop
Sizes: ¾", 1", 1¼", 1½", 2", 2½"
Inlet: Inside I.P. Thread
Outlet: Inside I.P. Thread
Finish: Black or Galvanized
Working pressure to 125 p.s.i.

H-11170 Solid Head
125 pound LubOseal Stop
Sizes: ¾", 1", 1¼", 1½", 2", 2½"
Inlet: Inside I.P. Thread
Outlet: Inside I.P. Thread
Finish: Black or Galvanized
Working pressure to 125 p.s.i.



H-11173 Solid Head—Recessed Ends
125 pound LubOseal Stop
Sizes: ¾", 1", 1¼"
Inlet: Recessed Inside I.P. Thread
Outlet: Recessed Inside I.P. Thread
Finish: Black
Working Pressure to 125 p.s.i.

Since 1857 SERVING the Water and Gas Industries

MUELLER CO.
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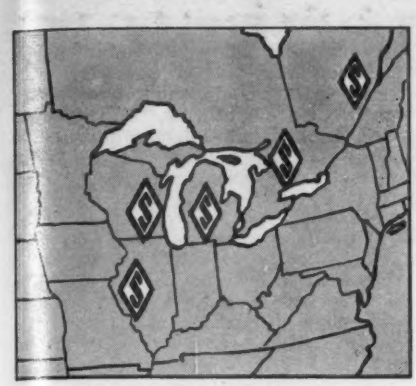
Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario.



SOMERVILLE offices serve the mid-west and Canada

From the provinces of Ontario and Quebec to the states of Ohio, Indiana, Illinois, Iowa, Wisconsin and Michigan, Somerville offices provide localized construction supervision you can rely on.

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SIGN OF SATISFACTION
TRANSMISSION LINES
DISTRIBUTION SYSTEMS

1897 1958

GOODMAN
USED SINCE 1897
2" HANDLE & LOCKING SLEEVE
GAS MAIN STOPPER

PIPE STOPPERS OF ALL KINDS

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SAFETY GAS MAIN STOPPER CO. INC.

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Brooklyn 17, N. Y.
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● **Shermer L. Sibley** has been named vice president and general manager of Pacific Gas and Electric Company. He has been PG&E's vice president and assistant general manager since 1955. Two other appointments in the top management recently announced are **Arthur J. Swank,** vice president in charge of general construction, becomes vice president in charge of electric operations succeeding **George A. Peers,** who leaves active service under the company's retirement plan. **Herbert W. Haberkorn,** now manager of hydroelectric construction, has been elected an officer of the company and will succeed Swank as vice president in charge of general construction.

● New York State Natural Gas Corporation has announced the appointments of **Albert H. Reschke** and **Joseph E. Coddington** as assistant managers, engineering.

● **S. R. "Steve" Sawyer,** formerly of El Paso Natural Gas Company, has been appointed chief engineer of Trans-Canada Pipe Lines Limited, with headquarters in Toronto.

● Surface Combustion Corporation has announced the election of the following executive officers: **James P. Farrell,** vice chairman of the board; **Henry M. Heyn,** president of Surface Combustion Corporation and president of Surface Industrial Division; **Robin A. Bell,** executive vice president of Surface Combustion Corporation and president of Janitrol Division; and **Albert J. Buckenmyer,** director.

● **Philip E. W. Goodwin, Jr.,** general manager of Rockwell Manufacturing Company's Sulphur Springs, Texas, valve plant for the past five years, has been named general manager of the company's new valve plant in Kearney, Nebraska.

● **Robert C. Swagler** has been appointed to western division manager of The Peoples Natural Gas Company of Pittsburgh. **Lloyd W. Haught** succeeds him as manager of the Glenshaw service area.

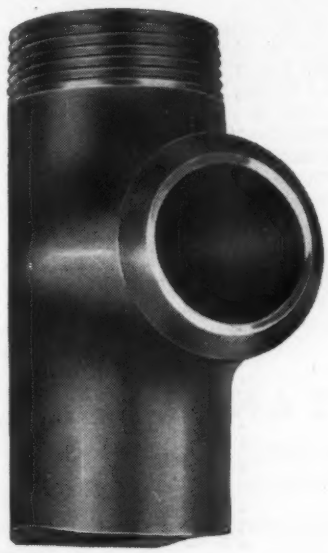
● **John Lawrence,** executive vice president, has been named a director of Dresser Industries, Inc. Re-elected at the annual meeting were the following directors: **H. N. Mallon,** chairman of the board; **Norman Chandler, Henry P. Isham, Willard M. Johnson; L. W. MacNaughton, William A. McAfee, J. B. O'Connor, R. E. Reimer,** and **Tom Slick.** John Lawrence who moved to a Dresser vice presidency in 1957 from his former position as president of Joy Mfg. Co., was appointed executive vice president last December 1957.

● **John L. McCaffrey,** chairman of the board and chief executive officer of International Harvester Company, has announced he will retire from active management in May, after 49 years of service with the company. He will continue as a member of the board of directors and the executive committee of the board. **Frank W. Jenks,** president, succeeds McCaffrey as chief executive officer of the company. Office of chairman of the board will not be filled.

● **Harmon B. McLendon** has been appointed account executive for industrial controls sales in the Southern California area by General Controls Company.

New
TAPPING TEE
FOR GAS MAINS
by Nibco

PART NO. 4911 - GS
Made from Schedule 40 ASTM A-106 A or B carbon steel



- *WELDS TO MAIN AND 1-1/4" SUPPLY LINE*
- *COLD-FORMED FROM SEAMLESS STEEL TUBE*
- *EXTRA STRONG, EXTRA SMOOTH INSIDE AND OUT*
- *COMPLETE WITH PLUG AND CAP*

NIBCO

since 1937 manufacturers of wrot copper, carbon and alloy steel fittings

for complete information write
NIBCO INC.
Dept. H-8010 Elkhart, Indiana

Personals

● **William H. Shenkle,** chief engineer of Rockwell Manufacturing Company's Instrument Division, has been promoted to general manager for the division.

● **Charles Q. Giffin** has been appointed Southern California district manager of the Metalbestos Division of the William Wallace Company.

● **James W. Smith,** sales engineer of the Sprague Meter Company, has moved his headquarters to Kansas City, Missouri. His new territory will cover Missouri, Kansas, Nebraska, Colorado, Northern Oklahoma and Southern Wyoming. **Ray Fogelman,** sales engineer of Sprague's Houston office, will cover Southern Oklahoma.

● Norge Division, Borg-Warner has announced the promotion of three sales executives: **Harold P. Bull** has been appointed vice president of sales; **Walter C. Fisher,** director of distribution; and **James D. (Dan) Dougherty,** national field sales manager.

● **Bertram J. Milleville** has been named director of engineering and research for The Ohio Injector Company. He will head the company's recently announced product development program.

● **W. F. Munnikhuysen,** chairman of the board of Koppers Company, Inc. since 1955, has retired from that position, and **Fred C. Foy** has been elected to the dual position of president and chairman of the board. Munnikhuysen, who has reached the age of 65, remains as a member of Koppers board and will continue as a consultant to the company.

● **Ralph L. Leadbetter,** president of Burgess-Manning Company, has retired because of poor health. He will continue to be associated with the company in a consulting capacity and as a director. **S. G. Paddock,** elected to the office of executive vice president one year ago, has been elevated to the presidency to replace Leadbetter. **H. A. Dietrick** has been promoted to vice president in charge of the industrial silencer division.

● **Dr. Salvatore Piccione** has joined the research and development department of Pittsburgh Coke & Chemical Company. A physical chemist, Dr. Piccione has been assigned to the analytical and physical research section of the R & D laboratory.

● **Bill Talmage,** industrial sales executive, has been promoted to the position of general industrial sales manager for Massey-Ferguson Industrial Division. He was formerly central regional industrial sales manager for M-F industrial division.

● **W. W. "Win" Harris** has been appointed vice president, marketing, for Roots-Connersville Blower Division of Dresser Industries, Inc. He will be responsible for marketing Roots-Connersville equipment throughout the U. S. and Canada.

● **Howard Snyder** has been appointed sales manager for residential gas heating controls of Minneapolis-Honeywell Regulator Company. He succeeds **J. P. McCardle,** who recently was named manager of Honeywell's operation in continental Europe. **J. W. Park** succeeds Snyder as Milwaukee sales manager.

● Surface Combustion Corporation has announced the following promotions: **E. W. (Doc) Weaver,** staff assistant to the vice president, engineering; **Don Beggs,** manager of engineering, furnace divisions; **O. E. Cullen,** manager of research and development department and **J. Montagino,** chief engineer, special heat treat division.

● **James D. Hesser** has been appointed national builder sales manager for Dixie Products, Inc. He was formerly national sales representative for custom kitchens department of Westinghouse's major appliance division. **H. George Driemeyer,** appliance buyer for Biederman Furniture Company, has been appointed new West Coast sales manager for Dixie.

● **Robert S. Boyd,** onetime manager of the evaluation division of Pittsburgh Pennsylvania Railways Company, has been appointed manager of the appraisal division of Stone & Webster Engineering Corporation. This division conducts appraisal work for clients in all fields of business—commercial industrial and public utility — and for many branches of government.

● **James A. Kerr** has been named public relations manager for Caloric Appliance Corporation. He was formerly director of public relations for Federal Pacific Electric Company. In his new position he will be responsible for national programming of public relations for the firm's gas appliances and architectural porcelain enamel lines, corporate and community special events, and related activities.

● **Don A. Beckenbaugh** has been promoted to the newly created position of sales and manufacturing administrator of J. I. Case Company. Formerly, he was divisional sales manager of the company. Beckenbaugh now reports directly to Marc B. Rojtman, president, and has full responsibility over the coordination of sales and production requirements of the company.

● The Condit Company, process equipment manufacturer's representatives of Tulsa, Oklahoma, have announced the appointment of **James A. Hallett** as sales engineer.

● **Paul K. Eckhardt** has been appointed manager of the newly created general apparatus department of Union Switch & Signal, Division of Westinghouse Air Brake Company, which was formed by consolidation of the general apparatus sales department and the general apparatus engineering department. Eckhardt was formerly manager of the general apparatus sales department.

● The Ohio Injector Company has formed a new valve distribution district for the Southwest and Gulf states area with headquarters in Tulsa. **E. G. Blaylock** has been named manager for the division.

● **Harold M. Jeske,** former vice president, operations, Florence Stove Company, has been elected executive vice president. The following officers were also elected: **L. R. Jensen,** vice president, production; **E. A. Toolis,** controller and assistant treasurer; **W. E. McTague,** secretary, and **W. C. Waggoner, Jr.,** vice president and treasurer.

● **Erwin E. Hirschberg** has been named sales manager Industrial Combustion Division, Eclipse Fuel Engineering Company.

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As the demand for pipe fabrication in all phases of industry increases, welding shops are busier than ever, and portable, adaptable equipment like H & M Pipe Cutting and Beveling Machines, is becoming more important every day. H & M machines—for pipe of 1½" to 36" in diameter—deliver speed, accuracy, durability and economy, even in the hands of inexperienced operators. Yet, they are easily moved from job to job, or shop to field, and can be stored away conveniently in their own specially-designed boxes.

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Typical is the experience of a utility in a coastal area. For a thorough trial, this company applied TAPECOAT in areas where severe corrosive conditions were known to exist. The lines were dug up this year and, after years of service under severe conditions such as brackish waters and corrosive soil, the pipe showed no signs of corrosion, proving the quality of TAPECOAT protection.

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TAPECOAT comes in rolls of various widths and is available in asphalt. Where primer is desired, specify TC Primecoat, the compatible coal tar primer.

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American's new ***GASCLOK*** is a completely self-contained air or gas powered instrument drive and timing unit. Supplying a constant power output of over 20 times the torque delivered by conventional spring-wound clock mechanisms, it is ideally suited as either original or replacement equipment where continuous power and accurate timing are essential.

Perfect for all circular or strip chart records from one-hour to 30-day periods. Constant power and timing accuracy are assured since there is no "mainspring" to weaken or run down. Rugged durability and dependability are built into the ***GASCLOK*** Power Drive for years of service with minimum maintenance. It can provide new metering accuracies and economies for you.

for instrument driving and timing
self-starting • air or gas operated

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The high-torque, continuous drive provides power for: *Integrating Orifice Meters—Gas Lift Meters—Pressure Recorders Strip Chart Recorders—Telecounter Units—Field Program Timers* and many other instrument applications for accurate, automatic operation.

- **Self-starting mechanism completely self-contained—requires no winding or "priming" of power unit.**
- **Gas or air consumption only 5 cfh—normal operating pressure 5 psi—rotation 2 rpm.**
- **Timing escapement spring rewound every 5 seconds—eliminates fluctuating torque.**
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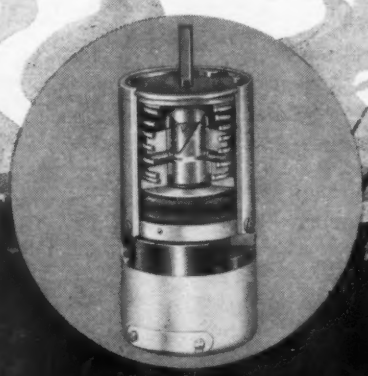
- **Timing mechanism internally sealed to prevent corrosion and clogging—all power unit parts exposed to gas are aluminum or stainless steel.**
- **Inherently explosion-proof.**
- **Large area internal ports to prevent plugging. All internal ports easily cleaned.**
- **Installation in any position—variety of mounting brackets available.**



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Truck-mounted backhoe used to dig trenches, bellholes, and large excavations has maximum reach of 17 ft from rear axle of truck, and maximum practical digging depth of 10 ft.

Hydraulic backhoe, mounted on standard 130-in. wheelbase will handle any kind of soil condition; is extremely mobile.

For Construction and Maintenance, Southern Counties Gas adopts . .

Four Money-Saving Ideas

FINISHING TOUCHES are being given to four new operating procedures by Southern Counties Gas Company that, when in full use throughout the California utility's eight operating divisions, are expected to save the company — and its more than 650,000 customers — substantial amounts of money.

The four new techniques, adapted to Southern Counties' needs by the firm's construction and distribution department, are:

1. Use of truck-mounted backhoe,
2. A lightweight trencher,
3. Pipe pinching and reopening operations, and
4. Use of cold wrap, anti-corrosion tape.

Truck Mounted Backhoes

The hydraulic backhoe, mounted on a standard 130-in. wheelbase, 15,000 lb GVW truck, has as its greatest advantages the fact that it will handle any kind of soil condition and is extremely mobile. Because of this mobility it is particularly good for work under emergency conditions. It can be moved to the construction site quickly and, once there, is flexible for most excavating situations.

The company currently has five backhoes in operation: One each in its Eastern, Orange County, San Gabriel Valley, Santa Monica Bay, and Ventura divisions. Three more have been ordered (for Harbor, Santa Barbara, and Northern divisions) and should be on the job by the end of the year.

Power for the backhoe is provided by a hydraulic pump driven by a power take-off from the truck's transmission. Southern Counties' construction and distribution department people indicate several makes of backhoes and trucks are available that are suited for this purpose.

The backhoe is used to dig trenches,

Lightweight, "boom-type" trencher digs narrow ditch, requiring less backfill and compaction; can "trench" around curves and tunnel under curbs; can be used on private property without tearing up customers' lawns. Belt-driven hydraulic pump provides power to drive crawler tracks and to lower and elevate digging boom. Estimated annual saving for each trencher is $7000 for machine trenching — $10,000 over hand digging.

bellholes, and large excavations. Maximum reach of the backhoe is 17 ft from the rear axle of the truck and maximum practical digging depth is 10 ft.

Southern Counties reports that the backhoe will dig 70 ft per hour in medium soil; 35 ft per hour in heavy rock, and carve out a bellhole in medium soil in 18 minutes, and in rocky soil in 32 minutes.

Compared to hand digging costs, the backhoe (including operator labor and part-time labor for an assistant) saves 42 percent in soft soil; 52 percent in medium soil; and 35 percent in rocky soil. Cost savings in digging bellholes are 32 percent over hand digging, initial data show.

Small Trenchers

The lightweight, "boom-type" trencher can dig a narrow ditch, thus requiring less backfill and compaction; can "trench" around curves; can tunnel under curbs, and is light enough in weight so that it can be used on private property, for example, without tearing up a customer's lawn.

Four trenchers are now on the job at Southern Counties: One each in Orange County, Eastern, and San Gabriel Valley divisions, and one soon to be assigned to Northern division.

A hydraulic pump, belt driven, provides power to drive the crawler tracks, and also to lower and elevate the digging boom. The digging chain and conveyor are driven by "V" belts from the air-cooled, four-cylinder engine. The trencher works to a width of 8-in. and reaches a maximum depth of 4½ ft. Average use per machine per month thus far has been 5620 ft. Trenching for main extensions and related services has been its widest use.

Including operator labor and truck mileage, operating costs of the trencher compared with hand digging are 68 percent in soft soil; 67 percent in medium soil, and 74 percent in hard soil.

Southern Counties estimates that the annual saving for each trencher is $7000 on machine trenching, and $10,000 over comparable hand digging costs.

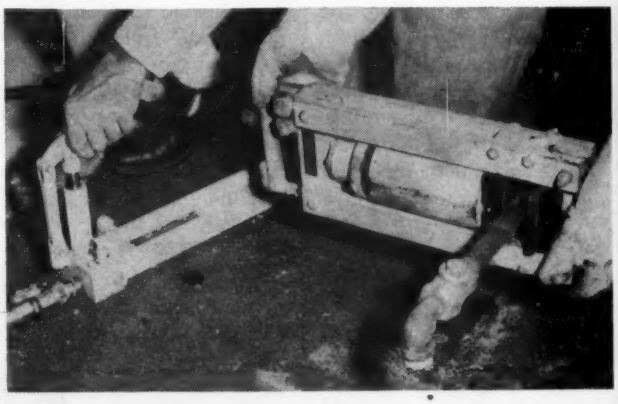
Pipe Pinching-Reopening Method

Pipe pinching and reopening under controlled temperature will be used to effect repairs on mains and services of up to 2-in. steel and 3-in. copper. Southern Counties has been pinching copper mains and services for nearly seven years and the use of the same technique on steel pipe is seen as a natural evolution.

Pipe pinching is being used at the present time, while the reopening operation is scheduled for application in the various divisions by the end of the year. The company believes control of

Pipe pinching operation is demonstrated by Welding Supervisor Walt Hutton, right, and Leo Hendrickson, machinist. Pipe is heated to 1600 F and then pinched hydraulically.

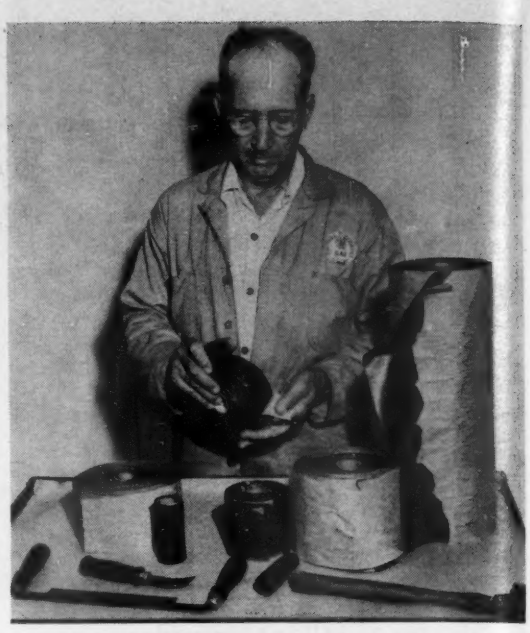
Specially designed reopening jaws are used to reopen pipe after it has been hot-pinched. Jaws fit in hydraulic unit.



Pipe is reheated and hydraulic unit with reopening jaws is placed over pinched area.

Under combination of heat and pressure, pipe conforms to shape of jaws returning to almost its original shape.

Cold-wrap anti-corrosion tape can be easily applied by hand to both straight lengths and elbows, tees, and other fittings.



Walt Hutton shows various widths of tape now being tested along with commonly used tools.

gas in broken mains and services and the abandoning of old mains and services has been made easier with use of pipe pinching.

The section of pipe to be pinched or reopened is brought up to a temperature of 1600 F with a heating torch and then subjected to a hydraulic pincher. For reopening, the pipe is heated and then clamped with the pincher, using a special set of circular-shaped reopening jaws. The pipe, malleable because of having been heated, conforms to the shape of the circular jaws and returns almost to its original shape.

Both pinching and reopening operations are handled upstream of the area where repairs must be effected.

Dr. David S. Wood, associate professor, California Institute of Technology, in a study conducted for Southern Counties on the adequacy and safety of pipe pinching and reopening, notes:

"The . . . pipe is subjected to rather severe deformation at certain points during pinching and reopening operations. While the circumference of the pipe remains in a somewhat deformed condition after both operations have been completed, the interior cross section is adequate to carry the required flow of gas.

"Mechanical tests for strength and ductility were made on several types of specimens of used . . . pipe. Used pipe was employed in order to obtain minimum properties to be expected after the pipe has been in service for an extended period. Tensile, hydraulic pressure, and bend tests were made on specimens of pipe which had been subjected to hot pinching and reopening operations. Results showed that service pipe subjected to hot pinching and reopening operations exhibit strength and ductility . . . entirely adequate for service use."

Thanks to pipe pinching and reopening, Southern Counties expects to save on the average of $4 for each service or main abandonment and repair. On the basis of 1957 operations (perhaps a little extreme in that last year was a busy one), savings from pipe pinching and reopening would be $15,000 annually.

Tape Wrapping of Pipe

Use of cold wrap tape for faster and easier application of anti-corrosion coating has been used successfully in "on-the-job" experiments. The tape eventually will replace the company's present standard coal tar and glass fiber wrap, which requires heating during application.

Leo Hendrickson demonstrates how holiday detector is used to check pipe after wrapping with cold wrap tape.

Southern Counties has been looking for a new type of commercial pipe coating for several years. Whenever a pipe wrap looked promising, the company put it through a laboratory-type trial installation. It had consultants on the job and explored some ideas of its own.

Basically, Southern Counties was looking for a pipe wrap that would be easy to install, low in cost, durable over a long-term life, adaptable to varied field conditions, and one which could be put on pipe and permit immediate backfill operations.

After extensive tests in the company's laboratory, the cold wrap tape has been applied experimentally in the field. Pipe "cold-wrapped" and left in the ground for four months was recently uncovered. Results were "very encouraging."

Experimental cold wrap tape has also successfully withstood the rigors of a boring operation. Future tests of cold wrap tape in boring will be made in increasingly abrasive soil.

The four new processes, Southern Counties Gas Company feels, have one important thing in common: Each represents an engineering breakthrough of sorts and, in each case, the result has been twofold—to make work easier and more interesting for employees, and to make operations more economical. ★ ★ ★

Soviets Studying Bio-Energy Plants

Still in experimental stage, production of high-methane content fuel gas from anaerobic decomposition of farm wastes and sewage seen as potentially huge source of economical gas supply for Europe and other areas of the world lacking natural gas reserves

Special report prepared for AGJ by **A. J. Steiger**

WHAT MAY BE the world's largest *"bio-energy plant,"* a gas-generating plant designed to produce 1000 cu meters (35,314 cu ft) of methane fuel gas per day from farm waste and manure, is being built on a state-owned livestock ranch in the Tula region of Soviet Russia, according to a scientific report from Moscow.

In this field of what is termed "green coal," a source of cheap farm power, Russian research engineers estimate that a dairy farm with 200 milk cows has a daily output of 15 tons of organic waste, from which 1000 cu meters of fuel gas can be produced every day.

Farm waste utilized at this rate for gas production would yield an annual output of a 250,000 cu meters (almost 9,000,000 cu ft) of natural gas, enough to heat 200 collective farm houses, the Moscow report stated. It added that this amount of fuel gas is the thermal power equivalent of 4000 cu meters of firewood of average moistness.

A "bio-energy station" producing gas from farm waste at the rate indicated above would also have a yearly output of 5500 tons of nitrogen-rich fertilizer, an important by-product of the gas-generating process, according to a report appearing in the Russian scientific journal *Priroda* (Nature).

Russian estimates, based on designs for large-scale waste processing plants, and cited in the report, show that capital investments in gas-generator installations can "pay out" in two to three years through increased crop yield and salvage of farm waste. Construction costs are estimated at 500 to 800 rubles per cubic meter of plant building; net cost of gas is given at 10 to 20 kopeks per cubic meter, and the fertilizer by-product cost would be less than for conventional manure. (The ruble is officially quoted at $0.25.)

"Countless are the resources of organic waste that agriculture yields in the form of straw, haulm, brushwood and manure," said G. D. Ananiashvili, an associate of the Georgian Research Institute of Mechanization and Electrification of Agriculture, Tbilisi, and author of the Moscow report.

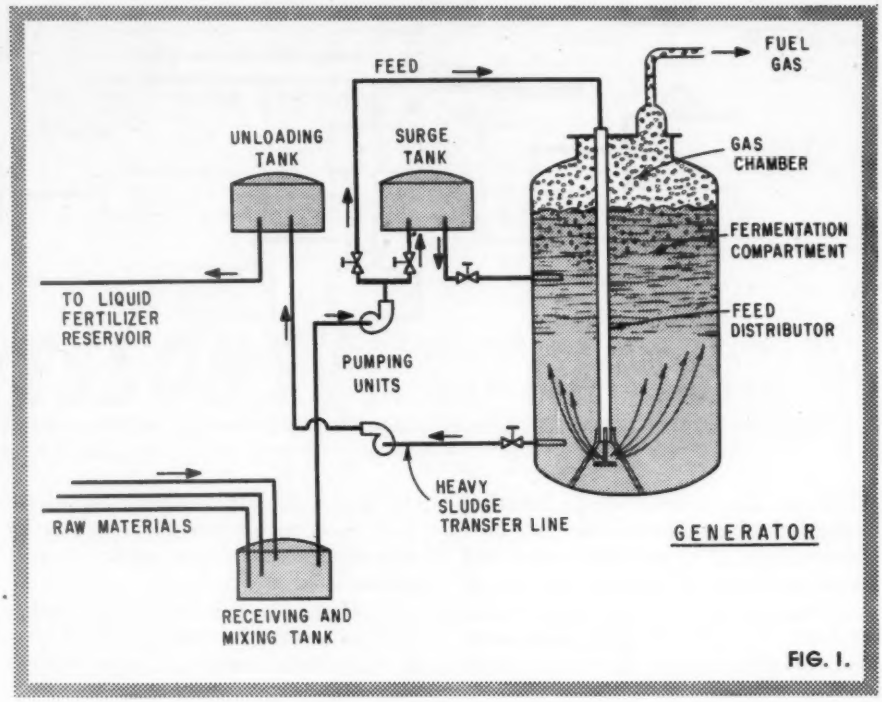


FIG. 1.

"There is no doubt," he states, "that the bio-energy reserves of agriculture, known as 'green coal' and estimated at hundreds of billions of kilowatt-hours of potential power, can in the near future become a reliable source of rural power reserve."

How the Gas-Generator Works

Scientific principles behind the move to get natural gas from farm waste and the designs of the gas-generating equipment being developed to utilize farm refuse in this way, are set forth by Ananiashvili as follows:

"Although the vast mass of animal and plant waste that accumulates on farms is utilized little, experiments have shown that all organic waste products, subjected to bacterial decomposition without access to air, i.e., in the conditions of anaerobic decomposition, can be a source not only of organic fertilizer but simultaneously also of fuel gases, chiefly methane, which can be utilized for heating purposes in farm production and home life.

"In public utilities, anaerobic decomposition has long since been resorted to for purification of contaminated waters and sewage. But a far greater effect can be obtained by employing the products of anaerobic methane fermentation as a means of power production. This problem in USSR as well as abroad is still in a rudimentary state and bears an essentially experimental character.

"Certain plants in USSR, Germany, and other countries have shown, however, that the new method of utilizing organic wastes is quite acceptable and extremely promising for agriculture.

"Numerous experiments have convinced us that the primary conditions for production of methane are airtightness of the fermentation compartment, constancy of temperature, pressure, medium acidity, and moisture of the fermentative mass.

"Proceeding from the point that one third of it will be decomposed, the optimal magnitude of gas formation in one ton of fresh manure amounts to about 60 cu meters (approximately

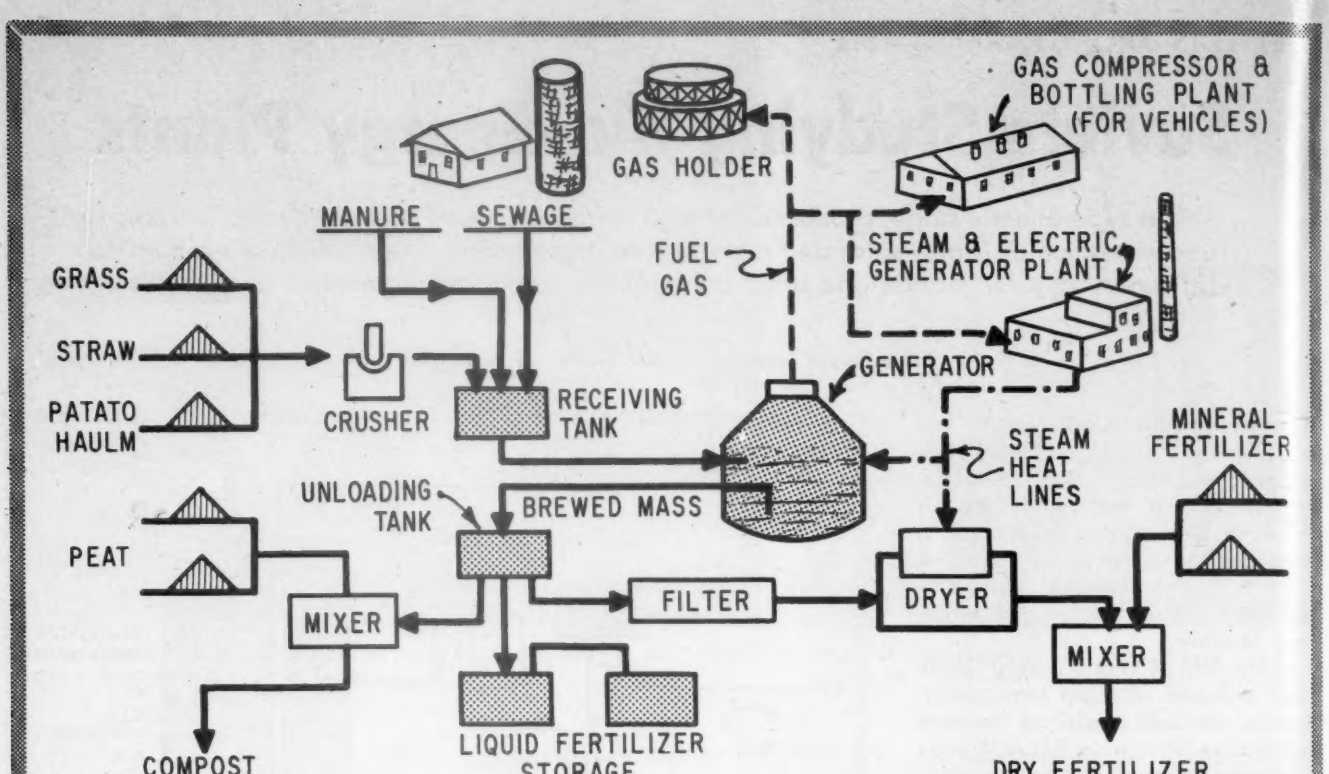


FIG. 2.

2100 cu ft), with average heating power of 5500 large calories per 1 cu meter of gas (1 large calorie = 3.965 Btu) or approximately 630 Btu per cu ft. This gas can be used as a source of heat, and also for generating electric power as well as for fuel in auto-tractor engines.

"The remnants after fermentation are a material rich in nitrogen, which has high fertilizer properties and can be used for direct fertilization of the soil as well as for preparing various organic fertilizing manures. The merit of these manures is that they are almost wholly devoid of weed seeds.

"The choice of the site and type of structure of the bio-energy power station depend on the conditions of concentration of waste products around rural enterprises and the means of their utilization. It is most profitable to locate such stations at livestock farms and ranches.

Two Types of Plants

"These gas-generating plants can be designed in several ways, but in working principle they are classed mainly as two systems — *delayed-action* and *accelerated*.

"The delayed-action units are developed in the form of independently functioning brick or concrete fermentation pits (bio-generators) with capacity of 5 to 10 cu meters. The loading of three to four such bio-generators alternately permits maintenance of uniform gas liberation during a 24-hour day. Such installations are, however, of low efficiency; they are applicable only in small farms.

"Classed in the accelerated-action system are the bio-energy plants with a high daily output of gas. Such a plant is a system of inter-related structures, consisting of bio-generators (fermentation compartments), pumping and boiler equipment, gas holder, reservoir of brewed mass, and other auxiliary equipment.

"The bio-generators in the form of ensilage towers are constructed of brick, concrete, or reinforced concrete. Fig. 1 shows the operating principle of an accelerated action bio-generator. All the processes are mechanized and electrified; automation of production is widely applied.

"The large-scale bio-energy plants at collective and state farm livestock ranches provide for the production of fertilizer manures — peat-manure, organo-mineral fertilizers, liquid fertilizers, etc. Such enterprises are essentially large agrarian power combines that can quite properly be called 'bio-energy stations.' Fig. 2 is a flow sheet of a large collective farm bio-energy plant.

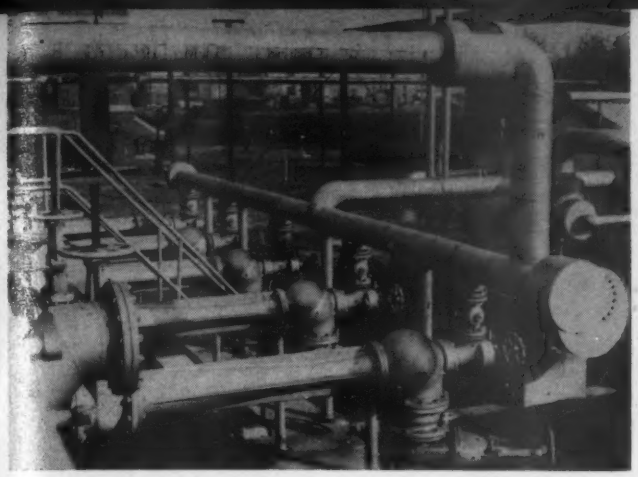
"Among the world's existing bio-energy stations, the largest in terms of productivity is the Breitenburg bio-gas plant in West Germany with daily output of 650 cu meters. The plant, scheduled to go up in USSR at the Pakhomovo state farm, Tula oblast, will have a daily output of 1000 cu meters.

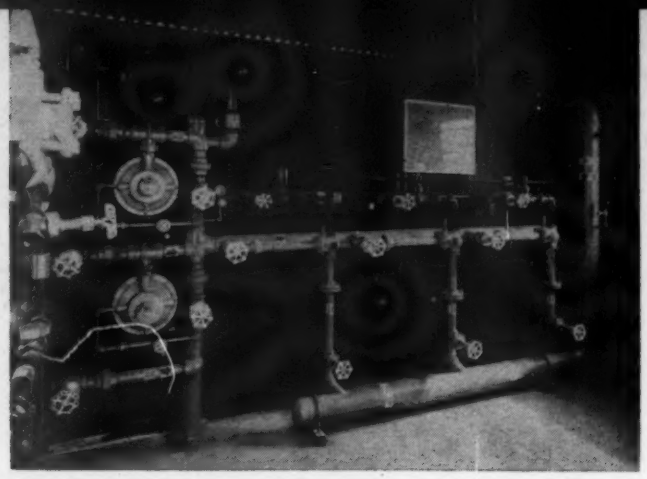
"The experience gained in operating existing low-output bio-energy stations in East and West Germany and in England, and also the design projects of large-scale plants in USSR and Germany show that the power and economic indices are still low because of the technical weakness of separate plant parts. Thus, in large-scale plants, the construction volumes of bio-generators amount to 0.7 cu meters for each cu meter of fuel gas produced, and annual power consumption for internal needs reaches 35 percent for the northern districts of USSR.

"The bio-energy stations are especially profitable for the large farming enterprises, particularly for the complex utilization of the great mass of organic waste at the consolidated collective and state livestock farms.

"Estimates show that, at modern dairy-livestock farms with a herd of 200 milking cows, in case of intensified bedding and the addition of non-fodder plant waste, the daily output of organic waste (80 percent moisture content) can exceed 15 tons, and the daily volume of gas-generation, 1000 cu meters.

"Current research in USSR and abroad is directed to improvement of the production process and the bio-energy plant equipment." * * *





Five jet compressors, above, mix butane or propane with atmospheric air and discharge mixture to gas holder. Spindle in each nozzle allows adjustment for either butane or propane. Each compressor has capacity of 210,000 scf of 540 Btu mixed gas per hr. **Upper right,** standby plant at Ford Motor Company, Sandusky, Ohio, uses three smaller compressors as gas-air mixers in installation made by H. Emerson Thomas & Associates, Inc., of Westfield, New Jersey.

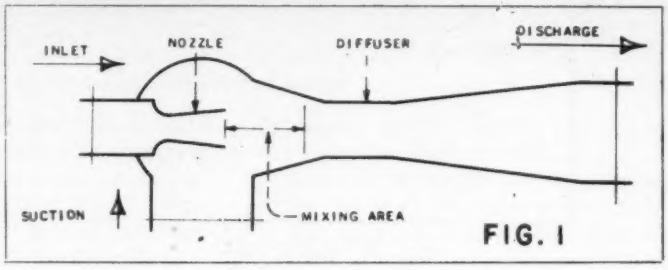


FIG. 1

JET COMPRESSORS devices of many uses in gas distribution

N. B. Hammond, *Engineering Department, Schutte & Koerting Company, Cornwell Heights, Pennsylvania*

JET EJECTORS are devices that employ high-pressure fluid gas (gas or liquid) to entrain a low-pressure fluid (gas or liquid) and discharge the mixture to some intermediate pressure.

The jet principle is not new. It has been used for many years in the form of steam jet and water jet exhausters (removal of gases under vacuum), and lifting and pumping of liquids as in the *eductor*.

It is only natural that the application should find its way into the gas industry where mixing and compression of gases is necessary and common. Since the principle of the jet ejector was known and in use, it was only a matter of applying theory and experimental data to design a device capable of operating in pressure ranges other than sub-atmospheric.

The mixing of two similar or dissimilar gases such that the higher pressure gas entrains the lower pressure gas with a resulting increase in pressure is performed by the type ejector generally designated in the gas industry as the *jet compressor*.

Waste of energy available for work costs money. If natural gas exists and must be throttled for mixing and distribution, a loss of energy occurs during the throttling process with a resultant increase in entropy of the gas. Whenever it is necessary to mix low-pressure natural gas with another low-pressure gas and compress the mixture for distribution, more work must be done and energy must be supplied from some external source to do it.

Because of the principle of operation of the jet compressor, much of the energy that is available in the natural gas expanding through the nozzle is reclaimed and made to do useful work by entraining a secondary low-pressure gas, and compressing the mixture to the pressure necessary for distribution. The compressor, therefore, replaces the reducing valve and utilizes available energy to perform the mixing and compression operation.

Jet Compressor Design

Jet compressors, as well as ejectors in general, consists of three basic parts: A nozzle, a body, and a diffuser. A schematic of the compressor is shown in Fig. 1 with these parts labelled.

Function of the nozzle is to convert the high-pressure gas into a high velocity jet stream. The diffuser converts the velocity head of the motive and suction gas mixture to static head, so that the proper discharge pressure may be obtained. The body serves as a mixing chamber. It also permits the accurate alignment of the nozzle and diffuser and fixes their position relative to each other.

Design of the nozzle follows basic thermodynamic laws. The design of the diffuser, however, is still partially empirical. When the first gas compressors were constructed, data was drawn from the steam jet ejector, which was in established use. The compression ratios achieved and the performance factors obtained from the steam ejector made it clear that design of the jet compressor was possible. The design was approached from the theoretical standpoint, as far as critical dimensions in the nozzle and diffuser were concerned, but development testing resulted in certain modifications that were found to improve the performance.

Performance of the jet compressor depends on the transfer of momentum in the gas expanding through the nozzle to the relatively slow moving fluid entering the suction connection. The ratio of entering and final momentum is very close to 97 percent for jet compressors commonly used in gas plants.

Fig. 2 shows a simplified Mollier diagram that describes the process of expansion, mixing, and compression that takes place in a jet compressor. Gas passing through the nozzle expands from pressure P_1 to pressure P_s along line 1-S at constant entropy as shown by the solid line.

Actually, this is not true, and the dotted line represents the actual process showing a resultant increase in entropy. Mixing of the nozzle gas with the secondary gas occurs at pressure P_s at point S″, and compression of the mixture to pressure P_2 occurs along the dotted line 2-S″. Although we know that the above process occurs, actual determination of the shape of the expansion and compression lines require

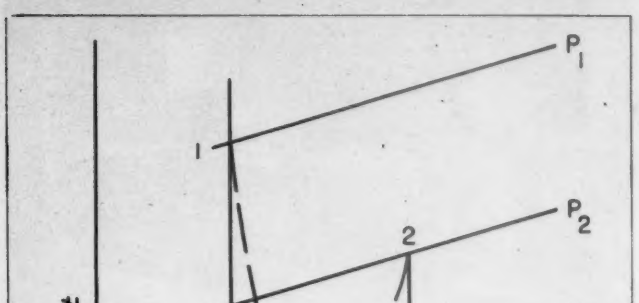


FIG. 2

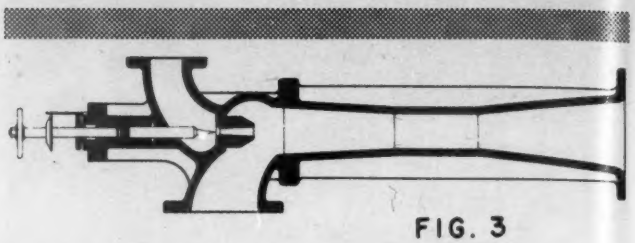


FIG. 3

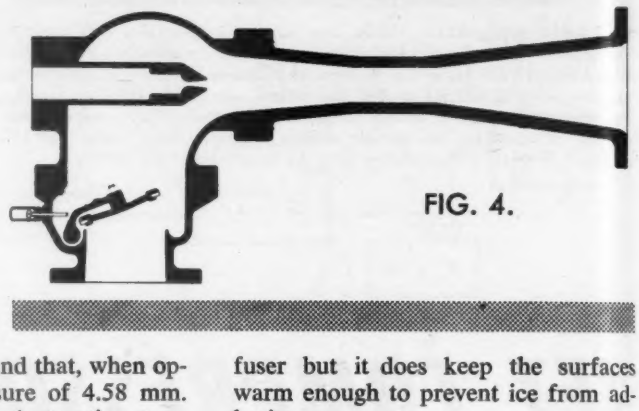


FIG. 4.

theoretical analysis. Actually, compression of the mixture from P_s to P_2 is assumed to occur at constant entropy as represented by line 2-S'.

Types of Compressors

There are two basic types of compressors in normal use in the gas industry. The one shown in Fig. 3 shows the same basic components as the schematic. The distinguishing feature of this unit is that a spindle operated externally by a handwheel can be positioned in a nozzle orifice to increase or decrease the motive gas flow through the nozzle.

This type was used in early installations when conditions of operation were not yet fixed, and requirements of the application were being investigated. This type is now used in plants where interchangeability of nozzle gases is desired. Since the spindle can change the orifice area, the changeover from the use of one gas to another, with the compressor operating at high efficiency, is achieved very simply.

The other type of compressor, as shown in Fig. 4, is the one in more common use in today's plants, and was built especially for the gas industry. It has no spindle and its design is based on the premise that only one motive gas will be used. It is also equipped with an integral check valve in the suction. Use of the check valve and its necessity is explained later.

Ice Formation Early Problem

One significant feature in the construction of both compressors is the long tapered diffuser. This enables the unit to attain the high compression ratios necessary.

In 1936, when experiments were being conducted with the four-stage steam jet ejector, it was found that, when oprating below a pressure of 4.58 mm. of mercury absolute (saturation temperature 32 F), ice was deposited in the diffuser as well as on the outside of the steam nozzle. This changed the diffuser contours and interferred with the proper operation of the ejector. A steam jacket on the diffuser was found to eliminate this difficulty. Ice formation on the nozzle surface caused no trouble as it apparently would break off before building up to a thickness that would be objectionable.

The same problem arises in connection with some jet compressors. For some service, particularly with natural gas, it is necessary to steam jacket the diffusers. Without proper jacketing, moisture that enters in the gas or entrained air freezes due to the low temperature that natural gas assumes when it expands through a nozzle.

Natural gas in wintertime is often at a temperature of about 40 F. If it is expanded through a nozzle from 100 psig to atmospheric pressure it will leave at approximately –160 F. As in the steam jet ejector, ice formation in the diffuser will cause trouble and malfunction of the equipment will result.

Although ice formation on the nozzle generally will not cause difficulty, it is sometimes necessary to jacket the nozzle if the nozzle gas is expanding through a large pressure differential so that the gas issued is at extremely low temperature. The main problem is that a bridge of ice may form from the nozzle to the diffuser. This is particularly true in small compressors where internal body volume is limited.

Heat supplied from the jacket does not heat the gas in the nozzle or diffuser but it does keep the surfaces warm enough to prevent ice from adhering.

Gases generally used in conjunction with the gas jet compressor are natural gas and liquefied petroleum gases such as propane and butane. The presence of liquid in propane or butane is detrimental to the operation of the compressor. It not only decreases the flow through the nozzle orifice but does no useful work after passing through the nozzle. It is necessary, therefore, that propane or butane be supplied under superheated conditions. This eliminates the liquid phase and delivers the gas to the nozzle at a higher energy level.

History of Development

There is a record of jet compressors being employed in 1936 when "venturi injectors" were used in a mid-western plant to use natural gas and air for under-firing ovens. With continuing success in the use of compressors, the Peoples Gas Light & Coke Company in Chicago made plans to under-fire their ovens with a 550 Btu mixture of natural gas and air. Several compressors with a total capacity of 8,000,000 cu ft per day mixed gas were installed. Btu control was achieved by adjustment of gate valves in the air suction lines. Operation was against 13-in. w.c. in the holder.

A gas plant in Indiana supplied coke oven gas at 570 Btu and 6-in. w.c. pressure. Available was natural gas at 910 Btu and 20 psig. A gas compressor was utilized to mix the natural gas with 250 Btu blue water gas to provide a supplementary gas to coke oven gas. It was necessary to deliver the mixture to the

holder at 20-in. w.c. In this particular installation provision was made to alternately entrain atmospheric air instead of water gas so that a mixture of equivalent Btu could be made even when water gas was not available.[1]

Up to 1945 usage continued, but was still not widespread. In 1945 the Schutte and Koerting Company installed at the Minneapolis Gas Light Company two sets of jet compressors, one set consisting of one 18-in. and two 12-in. units, and the other set had one 18-in. and one 12-in. unit. These were of the design shown in Fig. 3 with manually operated spindles. These jets were designed to use natural gas at 40 psig to entrain air at 10 psig and discharge the mixture at 15 psig.

Alternately, the compressors used natural gas to compress manufactured gas at an equivalent Btu. Subsequent to this, four 10-in. compressors were installed at the above company to mix air with propane. Propane was available at 100 psig, air was entrained at 10 psig and the mixture was discharged at 16 psig. Gas was distributed directly into the mains under peak load conditions.

These jet compressors performed the operation successfully and this became the first major installation in the United States.

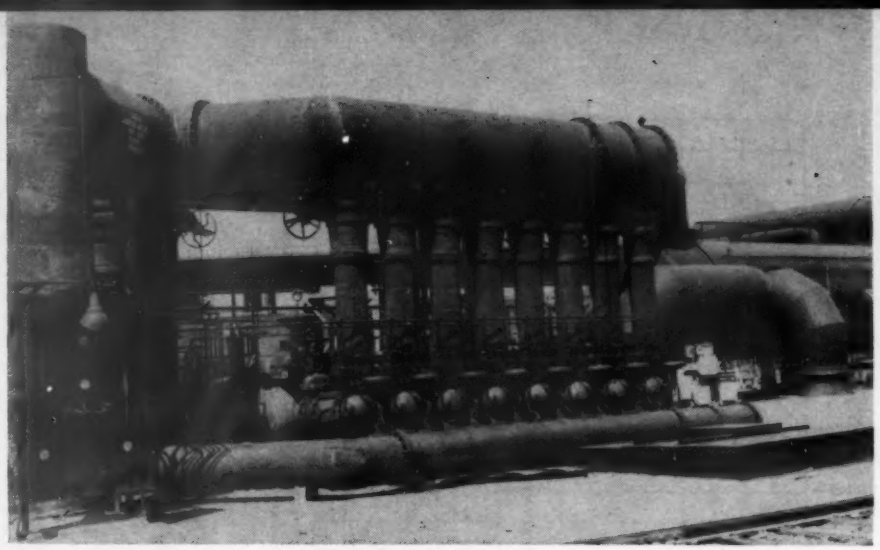
The first LPG-air system installed was at the Philadelphia Electric Company in the early part of 1946. These jets were of the manually operated spindle type and were designed to operate on either butane or propane gas at 40 to 50 psig and maintain a mixed gas Btu content in the range of 800 to 520. Maximum discharge pressure was specified at 25-in. w.c. The jets installed consisted of 4, 6, 8, and 10-in. units.

In the latter part of 1946 the jet compressor with fixed nozzle orifice and integral check valve was developed by the Schutte & Koerting Company and designed to operate in conjunction with a control system manufactured by Cutler Hammer, Inc. Automatic control was successfully achieved and the majority of present day installations consist of jet compressors of this type.

Many Applications Possible

Common uses of jet compressors are as follows:

1. To mix natural gas with a secondary gas or air to obtain a mixed gas of under 1000 Btu.
2. To use gas to entrain a stored gas of equivalent Btu and compress it to the necessary distribution pressure.
3. For emergency stand-by. This use generally involves LPG entraining air and is used in case of failure of mechanical equipment or loss of natural gas supply.



Battery of eight 16-in. jet compressors operating on butane.

4. For distribution purposes at small stations when no other source of gas exists. The units used here are generally of the LPG-air type. Gas is supplied by jets for distribution directly into the mains.
5. For peak load shaving. This is generally LPG-air.

Often it may be necessary to deliver natural gas into an intermediate pressure system from low-pressure holders where it may be stored during low demand. A high-pressure gas, of course, is used to perform the compression and an equivalent Btu results.

For peak load conditions, natural gas is often employed to entrain manufactured gas of similar Btu and boost the pressure such that it may be sent directly out into the transmission system. If a Btu value lower than 1000 is necessary, natural gas can entrain manufactured gas of low Btu or air and mix to obtain proper Btu and adequate pressure for distribution.

LPG can be used for like purposes entraining air for a mixed gas Btu in the range of 1300 to 1500.

One comparatively new application is the use of a jet compressor similar to that shown in Fig. 3 except that the position of the spindle is controlled by an air-operated diaphragm head. The application involves mixing two gases of equivalent Btu for distribution. The distribution line pressure determines capacity required from compressor.

A pressure controller taking signal from the distribution line positions the spindle such that it will close the nozzle orifice altogether if demand is low and line pressure is up, and open the orifice as demand increases and line pressure goes down.

Limitations to Use

The gas jet compressor derives its ability to do work according to the momentum existing in the gas expanding through the nozzle. If local or state laws limit the natural gas pressure in the lines, the performance of natural gas jets is fixed by this limitation. The

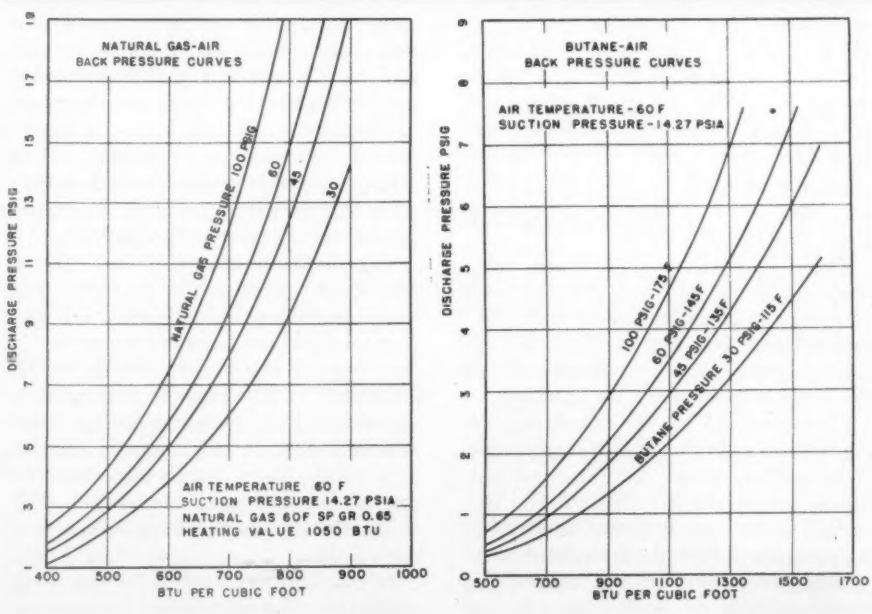

NATURAL GAS-AIR
BACK PRESSURE CURVES
DISCHARGE PRESSURE PSIG
NATURAL GAS PRESSURE 100 PSIG
60
45
30
AIR TEMPERATURE 60 F
SUCTION PRESSURE 14.27 PSIA
NATURAL GAS 60F SP GR 0.65
HEATING VALUE 1050 BTU
400 500 600 700 800 900 1000
BTU PER CUBIC FOOT
BUTANE-AIR
BACK PRESSURE CURVES
AIR TEMPERATURE - 60 F
SUCTION PRESSURE - 14.27 PSIA
DISCHARGE PRESSURE PSIG
100 PSIG - 175 F
60 PSIG - 145 F
45 PSIG - 135 F
BUTANE PRESSURE 30 PSIG - 113 F
500 700 900 1100 1300 1500 1700
BTU PER CUBIC FOOT

FIG. 5

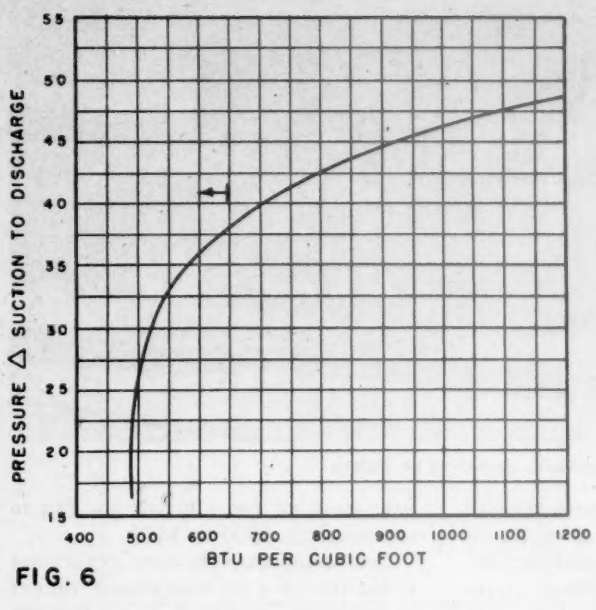


FIG. 6

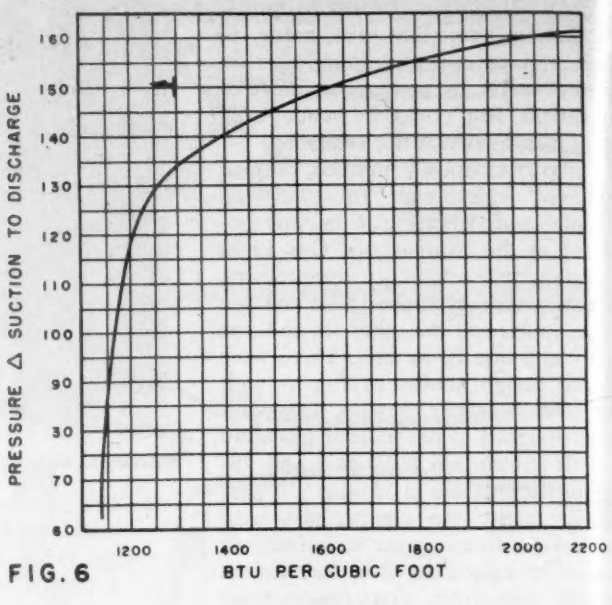


FIG. 6

higher the natural gas pressure available at the nozzle of a jet compressor, the higher is the discharge pressure that can be achieved.

The same, of course, is true in jets employing propane or butane gas in that the discharge pressure is once again limited by the pressure and superheat that the vaporizer can deliver.

Fig. 5 shows a comparison of performance of a jet operating on natural gas and one operated on butane with discharge pressure plotted against mixed gas Btu with nozzle pressure as the parameter.

Because natural gas has a Btu value in the neighborhood of 1000, it can only be used to make gas of that value or lower. Propane and butane on the other hand, have high calorific values and can be used for the higher mixed gas Btu. One reason natural gas can compress to a higher discharge pressure than either propane or butane is the fact that it has a lower molecular weight and consequently has more energy per pound of gas flowing. Another reason, of course, is the fact that because it does have a lower calorific value, not as much air or manufactured gas need be entrained to produce a given Btu value.

Depending upon distribution pressure, the mixed gas from LPG-air jets may have to be further compressed before transmission is possible, whereas, natural gas-air jets can deliver mixed gas directly at distribution pressure.

Characteristic curves are shown in Fig. 6 for a jet compressor using butane at 45 psig entraining air. The test was run by restricting the air flow into the suction of the jet, and thus increasing the pressure differential from suction to discharge which, of course, caused the mixed gas Btu to change. The curves plotted show pressure differential versus mixed gas Btu.

In order to achieve automatic control, the jet must be designed for operation to the left of the limit line, where small changes in Btu value represent relatively large changes in pressure differential. Here the positioning device has more latitude for operation than if the compressor were designed to operate to the right of the limit line.

The jet compressor is designed specifically for a given operation. It will entrain a certain quantity of gas at a given pressure using a fixed quantity of another gas at constant pressure and discharge the mixture against a designated back pressure. It is not possible to change the entrainment ratio under design conditions.

If the discharge pressure is lower than the design condition and all other pressures remain the same, the jet will tend to handle more low-pressure gas. The increase will be limited by the cross section area of the diffuser throat and can be estimated. Lower-than-design back pressure can also mean that approximately the same low-pressure gas can be entrained, but at a lower-than-design suction pressure. Any change in nozzle pressure will definitely upset design conditions and the compressor will operate differently.

Fig. 7 shows the effect of varying one or more of the three pressures that exist under design conditions.

An important point to remember is that the jet compressor is not at all adaptable to change in flow conditions unless nozzle or discharge pressures are also changed. It has a fixed performance under given design conditions. If any of the pressures are varied, performance is changed in accordance to the variance.

If a station is installed for use with propane gas to entrain air, a given capacity of propane-air mixture will result. If the station is used alternately with butane gas, a different capacity will result. Some stations are installed with spare nozzles available designed for different gases, so that the maximum performance may be obtained from the compressor if change-over is necessary. If change-over from one gas to another is frequent, a compressor with a manually operated spindle is recommended.

Control Systems

Because the jet compressor does not readily adapt itself to operation under varying flow conditions, it is necessary to employ a specific arrangement of compressors controlled by a relatively simple system.[2]

Essentially, the system consists of pressure regulators, demand regulator, a snap action selector and a butterfly valve in the air suction manifold operated by a diaphragm motor.

In order to cover the flow range necessary a system of compressors constituting a *15 rate station* has been very successfully used. The station consists of four compressors, having capacity ratios of 1, 2, 4, and 8, providing 15 different capacity ranges by proper combination of jets. A scheme such as this can be used to mix high-pressure and low-pressure gases for distribution directly into the mains.

Fig. 8 shows a diagram of the *15 rate station* adapted for a Cutler-Hammer operated control system. The principle of operation is based on maintaining a fixed pressure differential across the jets from suction to discharge. The magnitude of the differential depends on the mixed gas Btu which is a direct function of the ratio of gases being mixed.

For illustration, assume that the station is operating at low demand such that the smallest jet (capacity one) is in operation. The Btu controller has

positioned a butterfly valve in the suction line so that a fixed differential exists across the jet and allows just enough air to be entrained to give the desired Btu.

Assume that the demand for gas increases. This results in a lowering of the mixed gas pressure. When this occurs, a control automatically opens the air-operated valve in the nozzle gas line to the second largest compressor (capacity ratio two) and closes the valve in the nozzle gas line of the first unit. This means double the capacity is now being produced. The differential controller repositions the butterfly valve for the fixed differential and the extra demand has been satisfied.

When more gas is needed, the No. 1 unit that was originally operating will be called back into service and three times the original quantity will be produced.

As this process continues, 15 rates of capacity are available to cover the range. The control, such as the one described here, has maintained an accuracy of 1 Btu in 1000.

Not all stations are made as completely automatic as the one described above. If a station exists at the main

P_1	P_S	P_2	Q_S
DESIGN	DESIGN	DESIGN	DESIGN
<	=	=	<
<	=	<	=
>	=	=	<
>	=	>	=
=	=	<	> OR =
=	<	<	< OR =
=	>	=	>
=	>	>	> OR =

FIG. 7

distribution plant it is necessary to have the jet compressors turned on and off manually since discharge pressure changes may occur that do not necessarily mean that the demand for gas has gone up. In stations such as this the Btu is still maintained by the butterfly arrangement, but an operator is required to cut in and out the proper compressors. If the plant is small and the jets are providing the only source of mixed gas for transmission, the first system described would be applicable.

In stations such as described above it is necessary to tune each jet compressor individually. Because of slight difference in nozzle flow, or diffuser

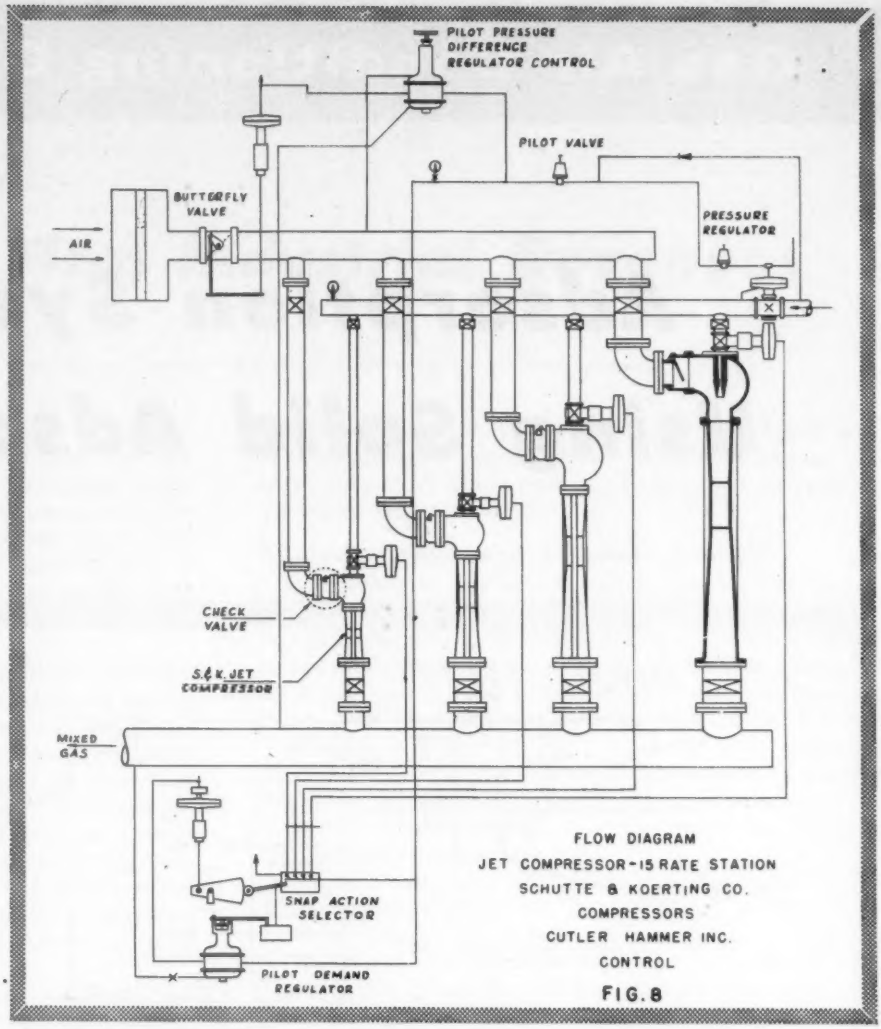


FIG. 8

machining, or piping arrangement, different entrainment will result.

An integral check valve is provided with each compressor together with a tuning screw so that the open position of the disc may be fixed. In tuning the station it is necessary to operate each compressor separately and adjust the position of the check valve disc until the proper Btu is obtained. Once this correction has been made for irregularities in the system or compressors, the arrangement described above will control automatically and it is only necessary to open the pressure gas valve. When a compressor is not in operation, the check valve seats tightly, preventing any mixed gas from feeding back into the suction manifold.

Future Uses

Many gas companies have satisfied their original needs for jet compressors and now require jets only for expansion purposes.

The application supplying gas to an intermediate pressure system, using gas from a high-pressure system entraining gas at low pressure, could be adapted to control as easily as the one described above. It is known that some plants have considered installing an arrangement for this purpose and it is probable that it will become more widespread.

Summary

Jet compressors in many instances have replaced the motor-driven compressor. They have the advantage of low cost motive power, making use of energy that otherwise would be lost. They have no moving parts, thus assuring a minimum of maintenance, and have the capability of operating as self-contained units combining the mixing and compressing operations into one.

Limitations of operation must be remembered in the design of any station. If proper planning and control is adhered to, this device provides a relatively inexpensive way to perform a necessary operation.

Bibliography

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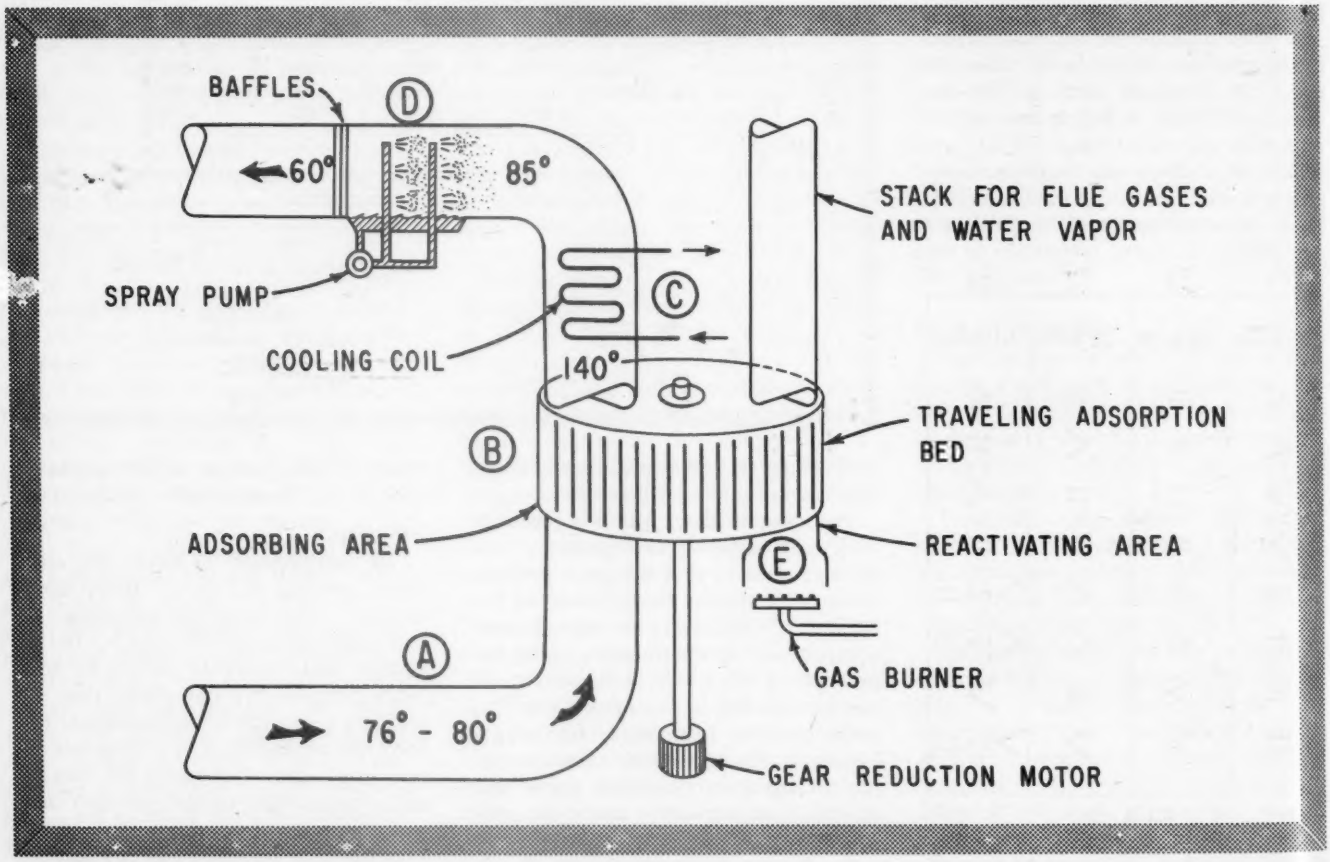
Acknowledgment

This article was developed from a presentation made by the author before the Operating Division Meeting, New England Gas Association, Providence, Rhode Island, June 1958. * * *

Adsorption Systems Using Solid Adsorbents



THE ADSORPTION SYSTEM is actually nothing more than another type of the open absorption type. The chief difference is that the adsorption type uses a solid material, such as silica gel, to physically adsorb water vapor from the air received from the conditioned space. Elements of the adsorption type system are shown in the accompanying diagram.

Air from the conditioned space enters the unit at Point **A** at a temperature about 80 F. The air then passes through a bed of solid adsorbent at point **B**, giving up its water vapor, and is thereby heated to about 140 F.

The hot dry air then passes over a cooling coil at Point **C**, where heat is removed by a cooling coil through which passes a cooling water stream. This cooling water is supplied by a cooling tower with a reduction in temperature to 85 F.

The air at this point is very dry and by passing it through a system of recirculating water sprays at Point **D**, the air is further cooled to approximately 60 F for delivery to the conditioned space.

The water vapor that is adsorbed by the traveling bed of solid material, is heated by a gas burner at Point **E** and at the high temperature, the water vapor is driven off.

Flue gases and water vapor then pass up the stack and out into the atmosphere.

By the use of a traveling bed of solid material, in this case a large wheel-type device, operated by a gear reduction motor, it is possible to have continuous operation of the unit. * * *

American Gas Fundamentals

Here's a tested formula for . . .

Estimating Firm Industrial Revenues

Donald C. Neill, *Rate Analyst, Southern Counties Gas Company, Los Angeles, California*

IMPORTANCE of reasonably precise estimates for firm industrial class service revenues is dependent upon the proportion of total company revenue derived from firm industrial sales; i.e., the larger the percentage, the more desirable that a precise revenue estimate be calculated. Companies located in large population centers will generally have a larger firm industrial business than those serving in more sparsely populated areas and therefore will be more vitally concerned with this type of estimate.

What is meant by a firm industrial customer? This customer is, first, a "firm" customer and therefore is not subject to interruption of service on the same basis as large industrial customers or boiler operators served on interruptible schedules. Second, the use of gas is generally for processing and manufacturing purposes. This excludes use of gas primarily for preparing meals, water heating, or space heating for human comfort and excludes residential type of service.

Typical customers in this class of service are laundries and dry cleaners, food processors, small kiln operators, dehydrators, bakeries, dairies, foundries, nurseries, metal processors, etc.

Even though the gas requirements for the individual business classifications may have seasonal characteristics by themselves, the total demand is fairly uniform throughout the year due to compensating seasonal variations, except for the space heating load, which will influence the monthly pattern of sales.

To this extent the overall sales characteristics are very similar to the general service class. Fig. 1 illustrates the stability inherent in the firm industrial load. The percentage distribution of sales by months, based upon a five-year average, is shown for a distribution utility in the southwest portion of the country where winters are fairly mild. The high percentage in November and December is due to the seasonal usage of several very large customers engaged in the processing of agricultural products.

A typical firm industrial rate schedule is shown in Table 1. The seasonal rate is designed with a winter block rate higher than the summer rate. The purpose here is to recoup some of the fixed costs associated with the facilities required to meet winter peak demands from the customers using facilities during that period.

It is interesting to note this rate schedule has specific conditions restricting the extent of space heating requirements that may be billed under the schedule. The same approximate result could be obtained if a reverse rate blocking at a given level were used, thereby recouping some of the higher costs of rendering space heating service under the schedule. This latter innovation would probably be confined, however, to the winter season.

EDITOR'S NOTE: This is the third article in a series dealing with the important subject of making estimates of revenues from each of the various classes of customers. The first two articles, on revenues from general service sales (domestic and small commercial) and from gas engine sales appeared in the AMERICAN GAS JOURNAL *June and September, 1958 issues.*

Analyzing Sales and Customer Growth

One of the first problems in approaching the revenue estimate is to estimate by months the number of customers expected in the future. This should be done by studying past trends and reflecting known influences effective within the estimated period. The historical Mcf sales per customer trend, on a 12-month moving basis, will also be required.

In order to analyze the data properly, charts should be prepared to see if a trend is being experienced. A monthly pattern of the sales per customer should be prepared at the same time and used to break down the total annual estimated sales per customer.

The total annual sales volume can then be developed simply by multiplying the two estimated monthly components: *Customers* and *sales per customer.*

A check of the resulting total sales is necessary in order to verify that it is in line with the historical sales trend. This can be done quite readily by folding in the estimated total sales by months with past actual sales and projecting the resulting trend curve into the future. The reasonableness of the projected line should be apparent, giving consideration to the basic assumptions of the number of customers and the assumed sales per customer. As with most historical trend statistics, it is advisable to use a period covering at least the most recent past five years.

A word of caution is advisable at this point. **The historical trend of total sales and sales per customer may be greatly**

Typical industrial customer is plant using direct-fired high speed patenting furnace for high carbon wire. Working temperature is 2220 F, for a 1300 F wire temperature.

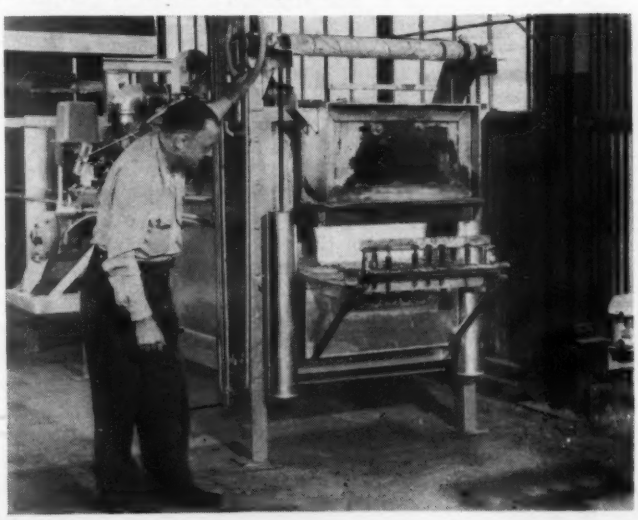


TABLE 1.
Typical Rate Schedule for Firm Industrial Service

	Per Meter Per Month Base Rates, 1110 Btu
Commodity Charge:	
Six Winter Months—	
November to April, Inclusive	
First 100 Mcf, per Mcf	56.1¢
Next 200 Mcf, per Mcf	51.1¢
Next 1700 Mcf, per Mcf	47.1¢
Over 2000 Mcf, per Mcf	45.1¢

Customers having space heating equipment aggregating more than 500,000 Btu per hr shall be billed at the initial block rate for all gas used during any winter month in excess of twice the average consumption of July, August, and September.

Six Summer Months—	
May to October, Inclusive	
First 100 Mcf, per Mcf	47.1¢
Next 200 Mcf, per Mcf	42.1¢
Next 1700 Mcf, per Mcf	47.1¢
Over 2000 Mcf, per Mcf	37.1¢
Minimum Charge:	
Per meter per month	$30

To be made cumulative only when total billing exceeds $360 per meter at any time during the contract year.

Special Conditions:

1. This schedule is not applicable to customers whose monthly billing for industrial process gas, exclusive of cooking, water heating, or space heating requirements, does not at least equal the minimum charge.

2. Customers whose seasonal pattern of operations results in little or no consumption during July, August, and September shall be billed according to the regular winter and summer rate if their connected space heating equipment aggregates less than 500,000 Btu input per hour. If the connected space heating equipment aggregates more than 500,000 Btu input per hour, the gas used in any winter month in excess of twice the average monthly consumption of July, August, and September shall be billed at the winter initial block rate, or such space heating gas may be separately metered under the appropriate general service schedule.

Necessary adjustments to the average monthly consumption for July, August, and September will be made for unforeseen shutdowns or major changes in the customer's equipment.

New plants receiving service for the first time during or prior to the winter season, and consequently not establishing an average monthly consumption for July, August, and September will receive service under the regular winter rate.

3. The obligation of the company to supply natural gas under this schedule shall not exceed the daily and/or monthly amount contracted for by the customer; provided, however, that gas may be delivered at daily and/or monthly amounts greater than specified above during times when such delivery will not be detrimental to service supplied under general service schedules. Customers served under this schedule have priority in the use of gas over customers served under Interruptible Industrial schedules, at times when there is insufficient gas to supply the demands of all customers.

4. A contract covering the fuel requirements of the customer for the operation of his plant for a period of at least one (1) year, will be required as a condition precedent to service under this schedule, and shall continue in force and effect thereafter until either the company or the customer shall give the other party thirty (30) days' written notice of a desire to terminate same, whereupon at the expiration of said thirty (30) days it shall cease and determine; provided, however, if the customer permanently ceases operations at any time such contract shall not thereafter continue in force.

influenced by weather conditions if space heating is allowed on the schedule in combination with the base processing load. Therefore, a sufficiently long period should be trended so that the periodic influence of abnormal temperatures can be taken into consideration in estimating the "normal" sales level for the future.

Other points to be considered in the plotting of historical statistics include the possible effect of rate changes whereby a significant number of customers may be influenced or required to change to another rate schedule, or where the special conditions of the rate schedule itself have been changed so radically as to have influenced the particular component being analyzed.

Estimating Revenues

Once monthly sales estimates have been prepared and adopted, they must be translated into expected revenue. At this stage additional historical data are required. The average revenue per Mcf actually received (or average rate paid) for firm industrial gas sales must be calculated by months. Table 2 sets forth such a summary of sales and revenue for a two-year period and the resulting average unit revenue.

The same general procedure presented in the article on estimating gas engine revenue is then used. This is shown on Fig. 2 where the average revenue per Mcf is plotted against the respective total MMcf sales for each month (in this case, the data in Table 2 are used). You will note that, due to the seasonal rate schedule, there are two distinct levels of points resulting from the plotting.

If a rate increase on a *cents per Mcf basis* had occurred during the period used for plotting purposes, it is necessary to adjust the respective points before going to the next step so that a constant rate level can be reflected.

A free-hand curve is drawn through each set of points and the average unit revenue for any specific sales volume during either the summer or winter season is then readily ascertainable. For example, assume that the June sales estimate is 290,000 Mcf. On the summer curve the average revenue per Mcf would be 42.5 cents for that volume. The estimated revenue for June would be calculated at 42.5 cents per Mcf times 290,000 Mcf, or $123,250.

TABLE 2.
Monthly Summary of Firm Industrial Sales and Revenue

Recorded Year A	MMcf Sales	Revenue	Average Rev/Mcf
January	299.9	$152,799	50.9¢
February	296.5	151,060	50.9
March	289.9	147,262	50.8
April	275.5	140,095	50.9
May	269.8	114,499	42.4
June	240.4	102,797	42.8
July	231.2	99,183	42.9
August	238.6	102,023	42.8
September	260.4	110,811	42.6
October	280.8	118,588	42.3
November	352.3	174,091	49.4
December	355.3	178,064	50.1
Recorded Year B			
January	330.7	$167,681	50.7¢
February	345.8	174,825	50.6
March	328.5	166,149	50.6
April	321.3	162,531	50.6
May	312.8	132,244	42.3
June	301.4	128,066	42.5
July	277.0	118,080	42.6
August	285.7	121,341	42.5
September	297.6	126,364	42.5
October	325.4	137,646	42.3
November	390.2	195,145	50.0
December	379.7	190,563	50.2

FIG. 1
FIRM INDUSTRIAL SALES PER CENT
DISTRIBUTION BY MONTHS
IN SOUTHWEST U.S.
(Five Year Average)

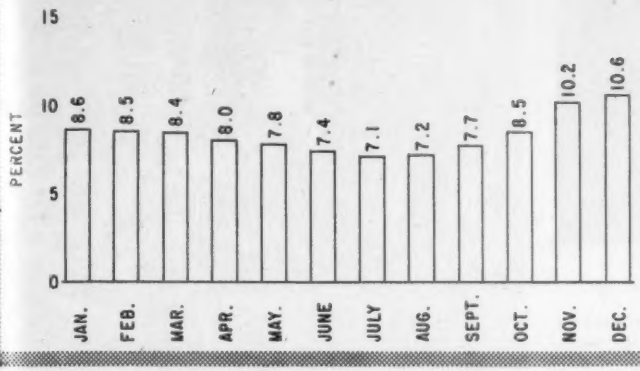
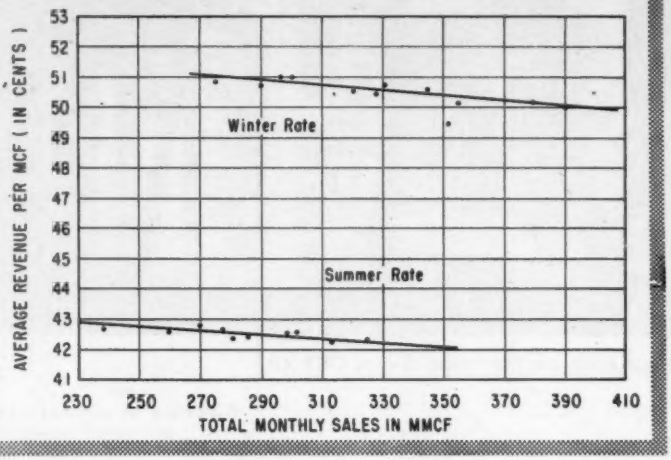


FIG. 2
FIRM INDUSTRIAL SERVICE
AVERAGE REVENUE PER MCF VERSUS TOTAL MMCF SALES



The *average revenue per Mcf* curves should be maintained currently so that any specific points that deviate substantially from the curve can be investigated.

For example, on Fig. 2, one month in the late fall shows an average revenue per Mcf considerably below the trend line drawn through the other points. Analysis of the basic data showed that this situation was caused primarily by two large customers who used the bulk of their gas requirements for agricultural processing during that month. The size of the load was of sufficient size to lower the average revenue per Mcf for the entire company.

Other reasons for a wide deviation might be an error in billing or possibly an error in plotting the point.

A change in the ratio of sales to customers in this class might influence the shape of the curve and, because the curve is based upon the average experience of all customers on that rate schedule, it is important that the curve itself represents their actual experience.

Estimates of revenue under proposed rates are easily calculated where the increase is in the commodity rate on a uniform cents per Mcf basis. For example, suppose the company is proposing a five-cent per Mcf increase in the commodity rate. If the above volume for June is used, the revenue estimate would be:

$.425 × 290,000 Mcf =	$123,250
Plus $.050 × 290,000 Mcf =	14,500
Total Estimated Revenue	$137,750

Unless a monthly estimate of the proposed revenues is required, you can just multiply the total estimated **annual** volume by five cents and add the result to the revenue estimate based upon the average revenue per Mcf curves described above.

Proposed increases in the minimum bill would, of course, be multiplied by the estimated number of bills to be rendered during the period concerned.

Another available method of estimating firm industrial revenues yield extremely accurate results for any given sales volume. It should be used, however, only where there is a fairly large number of customers in this class and where the seasonal or month-to-month load variations are not subject to wide swings resulting from the activity of one or two large customers. This method is identical with the formula calculation set forth in detail in the article on general service revenue estimates, *American Gas Journal,* June 1958.

The only variation is the magnitude of the allowable error. This is due to the fact that, with a larger average revenue per meter in the firm industrial class, a somewhat greater difference between the actual and calculated revenue per meter can be expected. The difference between the actual and calculated results for each class of service should be almost proportional, however.

If an annual allowable error of one-third of one percent for general service would be 25 cents on a $70 to $75 annual bill, based on an average two-cent deviation per meter per month, then for firm industrial revenues an average annual error of about $2 to $2.50 per meter allowable on an average annual bill approximating $600 to $700. This represents a monthly deviation of about 20 cents per meter.

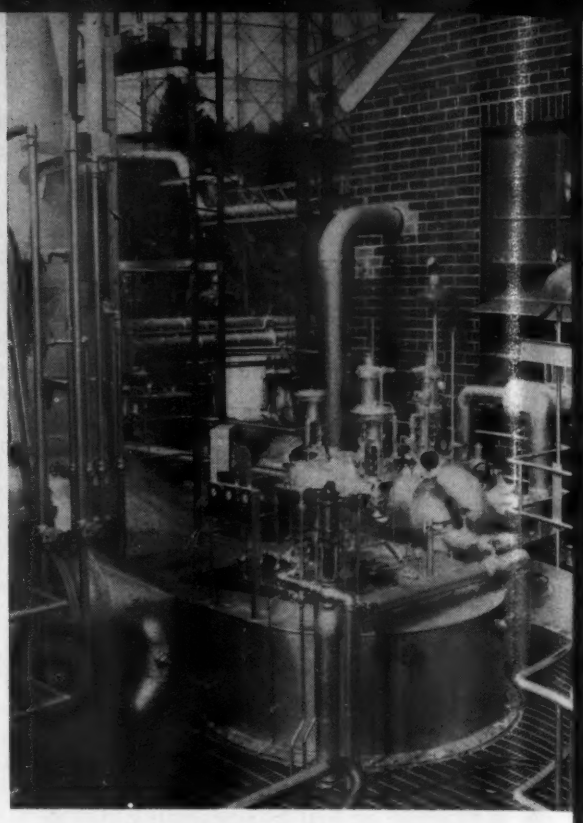
This second method of estimating revenues for the firm industrial class can be used for checking the accuracy of monthly billings by the accounting department, as described previously in the article covering general service revenue estimates.

Industrial customer uses 50-ft gas-fired radiant tube ceramic decorating kiln for firing decorated fine china, using 750 cu ft per hr.

Estimating For Rate Cases

In rate case work, the rate engineer is confronted with the problem of whether to adjust the space heating portion of firm industrial sales estimates for temperature variations. If the monthly sales pattern is similar to that shown in Fig. 1, it is quite likely that the effect of any temperature normalization process would be relatively insignificant and therefore may be an unnecessary refinement. The uniformity of sales is generally a direct function of the schedule itself, i.e., how much space heating load, if any, is allowed in conjunction with the base process load? In colder climates, and without any restrictions on usage, the peaking during the winter season as a result of allowing space heating gas on the rate schedule may very well point to the desirability of adjusting for normal temperatures. * * *

View from control room toward CCR set.



Close-up of windbox and burners at top of combustion shell.

At Philadelphia Electric, growing peak day demands meant adding reformed gas capacity at West Conshohocken Plant . . .

New CCR Unit Bolsters Peak Day Production

C. D. Buchholz, Jr., *Superintendent of Gas Production, Schuylkill Division, Philadelphia Electric Company, Philadelphia, Pennsylvania*

FROM 1951 TO MAY 1598, the Philadelphia Electric Company distributed a gas of 801 Btu per cu ft at 0.58 specific gravity, containing about 16 to 18 percent hydrogen. At the West Conshohocken plant, this gas was produced by mixing approximately 29 percent of catalytic reformed natural gas with 69 percent natural gas and 2 percent air.

Load forecasts indicated in 1956 the need for additional production capacity to meet the maximum day demands during the 1957-58 heating season, and a study was made to determine what type of apparatus should be installed to produce the required reformed gas. It had been decided earlier that the new unit should be located at the West Conshohocken plant, since this plant was near the center of the anticipated load growth.

Two types of catalytic reforming units were already in service at the West Conshohocken plant. Three continuous hydrocarbon reforming units had been installed between 1950 and 1953, and had proved to be highly efficient and dependable in base load operation. Also in 1950, an existing carbureted water gas set had been converted to the UGI cyclic catalytic reforming (CCR) process, and had been operated satisfactorily in peak load service. It was decided that the new catalytic reformer should be a cyclic unit.

How CCR Process Works

The CCR process itself is relatively simple. During the first half of the cycle, fuel is burned with excess air in the combustion shell and the hot gases pass into the reforming shell and through the catalyst bed, which is heated to about 1500 F.

During the second half of the cycle, a hydrocarbon is passed through the catalyst bed along with steam, to produce a reformed gas rich in hydrogen and low in Btu and gravity.

When additional inerts are required or can be tolerated in the base gas distributed to customers, then an increase in set capacity can be obtained by the continuous combustion method of operation. In this method, the combustion burner does not shut off completely during the reforming half of the cycle, but remains in use at a greatly reduced rate.

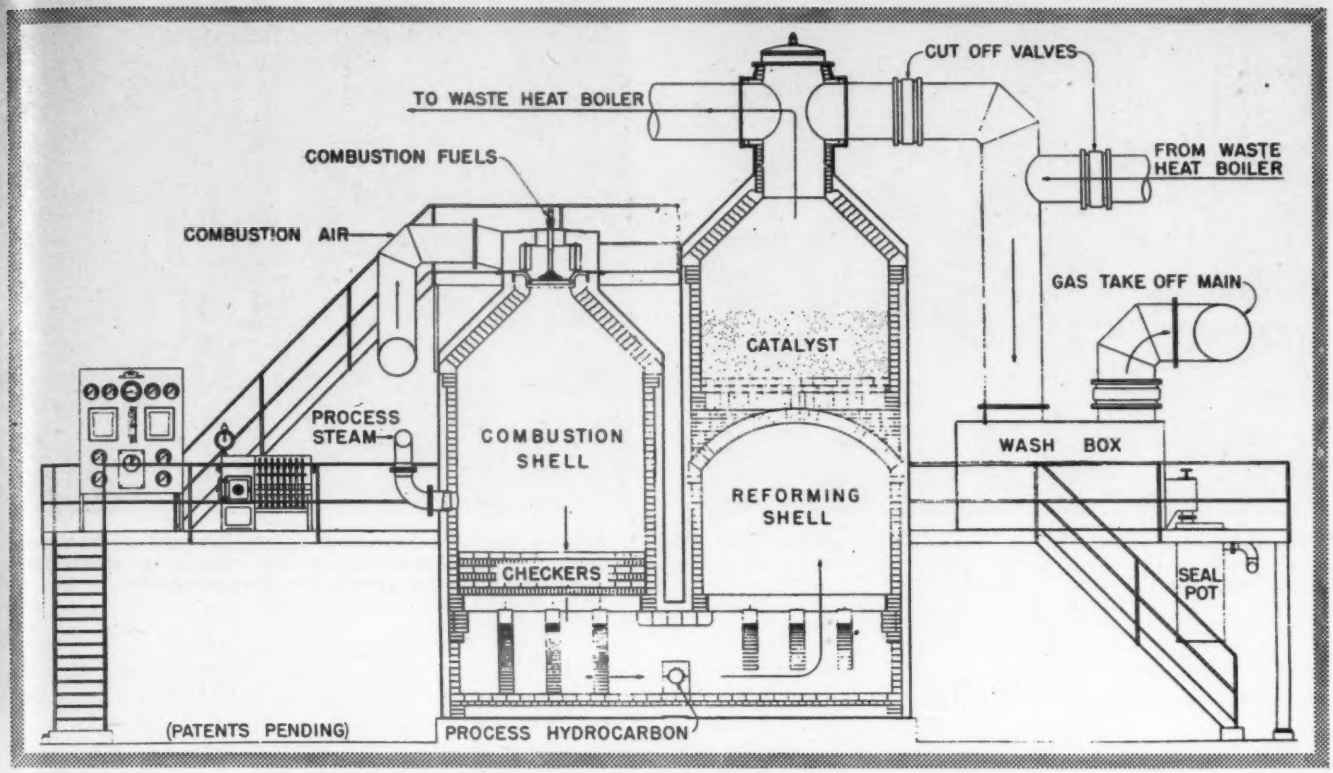
Various fuels may be used for heating and for the reforming process. At West Conshohocken plant, natural gas is normally used for combustion, but the set can also be fired with oil. Natural gas is normally used as the process gas to be reformed; propane has also been reformed very successfully on several occasions. Consideration was given to the use of kerosine as a process hydrocarbon but no kerosine equipment was installed. Space was provided on the control panel, however, to accommodate instruments required for possible future kerosine processing.

Description of Unit

The CCR unit designed for the West Conshohocken plant consists of 13′-0″ outside diameter combustion and reforming shells, with an 8′-3″ diameter vertical waste heat boiler, and was estimated to produce 19,100 Mcf per day of 282 Btu and 0.530 specific gravity reformed gas when cracking natural gas. The capacity when cracking propane was estimated at 16,900 Mcf per day of reformed gas at 276 Btu and 0.52 specific gravity.

All gases, both combustion and process, pass through the waste heat boiler, which consequently generates more steam than is required for the process. To make use of this excess steam, the auxiliaries such as boiler feed pumps, hydraulic system pumps, oil pumps and the air blower are all steam driven. In addition, high-pressure steam from the waste heat boiler at 150 psig is reduced to 125 psig and supplied to the main plant steam header where it is used for building heating, holder heating and other plant processes.

The combustion shell is ⅜-in. steel, 13′-0″ outside diameter and 24 ft high. The natural gas and oil burners for combustion are located in the combustion air windbox at the top of the shell.



Schematic of the UGI Cyclic Catalytic Reforming apparatus.

About a third of the way down the shell are two tangential 12-in. connections to admit process steam.

A cross-over connection measuring 6′-7″ high by 9′-6″ wide joins the combustion and reforming shells, and contains two 10-in. process gas connections located on opposite sides of the cross-over.

The reforming shell is 13′-0″ outside diameter and 43 ft high, with a 66-in. inside diameter connection at the top which leads to the waste heat boiler. A 56-in. branch connection leads directly to the wash box, and a 36-in. stack valve is installed above the take-off to permit operation with the waste heat boiler blanked off. The four-foot catalyst bed is supported on a set of firebrick arches in the upper half of the shell.

The combustion shell, reforming shell, and cross-over are lined with six inches of firebrick backed up with six inches of insulation. Very particular care was taken in the installation of the firebrick lining, especially in the bottom of the reforming shell, because past experience had shown that a tendency existed for hot spots to develop on the reforming shell, due to the back pressure of the catalyst bed. No open joints or voids in the firebrick or insulation were permitted.

These precautions were well worth the trouble and expense. No hot spots of any sort developed to interfere with full operation of the set the first winter.

Catalyst

The set contains 400 cu ft of 5 percent unpromoted nickel catalyst in ½-in. spheres. This quantity weighed 32,000 lb and the bed depth was 51½-in. when charged.

The ½-in. size was chosen because it furnished twice the surface area of the 1-in. catalyst, and even if the permissible blast rates are lower, it was felt that overall production would be increased over a longer period of time.

It was found that, in actual operation, the catalyst bed would begin to lift at 26,000 cfm air rates. Since the unit was indispensable during peak load periods, blast rates were conservatively restricted to a range of 24,500 to 25,000 cfm.

Natural Gas for Combustion and Reforming

Because the demand for process and combustion gas is cyclic, and would set up variations in pressure throughout the entire natural gas system in the plant, a surge tank of 4000 cu ft capacity, designed for 200 psi pressure, and a flow control system was installed. Once the proper settings for the controls had been established, the system worked very well.

Process gas is reduced after the surge tank to 15 psig and the flow to the set is regulated by a pneumatically operated butterfly valve, controlled from the operating room.

Combustion gas is likewise reduced to 10 psig and the flow regulated by two pneumatically operated butterfly valves, one of which controls the flow during the "open blow" portion of the cycle, and the other during the reforming portion of the cycle when using continuous combustion.

Propane for Reforming

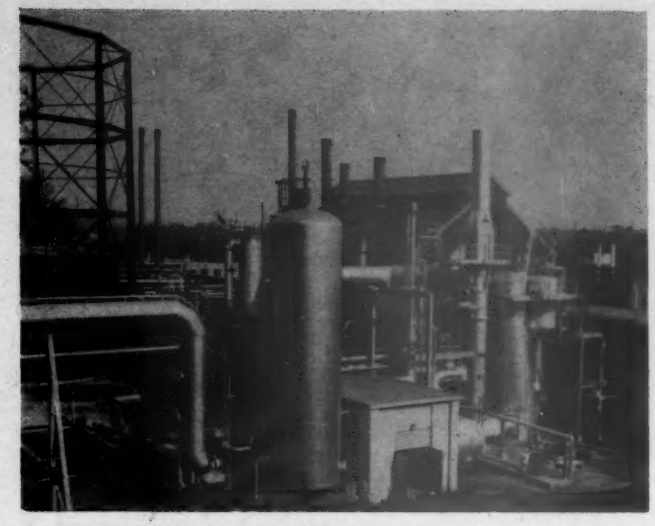
Propane vapor is brought to the set at about 75 psig and 150 F from the vaporizer. The pressure is reduced to 13 psig and a three-way valve connects the propane vapor into the process gas manifold just ahead of the control butterfly valve. The change from reforming natural gas to propane vapor is made by swinging the three-way valve during the combustion portion of the cycle and without shutting down the set.

Oil for Combustion

Oil used for the combustion cycle is diesel oil and is supplied to the set at 100 psig. Two hydraulic control valves and two manual adjusting valves are provided so that oil can be used either on open blow heating or continuous combustion. Both oil and natural gas can be used in combination, and on several occasions oil was used for open blow heating and natural gas for continuous combustion.

Blast Air

The steam turbine driven air blower produces 26,000 std cu ft per min air at 90-in. w.c. pressure with a steam consumption of 19,500 lb per hour. Hydraulically operated inlet louvers on the blower intake automatically close when the open blast is finished and reduce the flow for continuous combustion. In addition, a hydraulically operated air spill valve was in-



Control building with auxiliaries on first floor is at right. Building in center houses blower, and is flanked by large vertical surge tank and smaller condenser.

Control room, with instrument panel, is lighted by continuous luminous ceiling. Gages requiring close reading are at eye level. Related instruments and controls are grouped together.

stalled to dump the excess air on low rates, but it has not been found necessary to use this method.

Process Steam

Steam from the blower turbine exhausts at 10 psig into a 9-ft diameter by 30-ft long steam accumulator, which is the source of process steam. The accumulator was designed for 15 psig working pressure, but since sufficient process steam was obtained at the set with the lower pressure, it was possible to reduce steam consumption in the turbine by operating the accumulator at 10 psig.

Instrument Panel

In the photograph of the instrument and control panel, at right, it can be seen that symmetry was abandoned in favor of convenience in operation. Gages requiring close reading are at eye level, and related instruments and controls are grouped together.

The process instrument group is at the left end of the panel and includes indicating pressure gages, indicating flowmeters, recording flowmeters, flow control knobs, and flow integrators for process natural gas, propane, and steam.

The combustion group is in the center, with meters and gages for oil, natural gas and blast air. Control knobs are provided for flow rates of combustion gas and air, both cyclic and continuous combustion. Two temperature recorders are installed; one measures temperatures at six points in the set, the other measures catalyst temperatures only.

Steam use is adequately metered, with recording flowmeters, integrators and pressure gages on the steam produced by the waste heat boiler and the steam transferred to other plant processes.

To the right of the panel are the instruments for the reformed gas produced, including a calorimeter and gravity recorder. Because of the cyclic nature of the flow from the set, the calorimeter and gravity recorder do not give true readings of the gas produced, but they are reasonably close and are very useful in adjusting the operation of the set for best performance. At the extreme right is the safety panel for automatic shutdown of the set in case of materials flow failure, including gas, steam and air.

Starting Up

The set was started up early in October 1957, and was operated intermittently for six weeks; during that time minor difficulties, experienced in any new piece of equipment, were ironed out. Data was obtained on process flows, temperatures, and operating cycles for various rates of production. Four regular operators and one alternate were also trained during this period. The experience they gained through the frequent starting and shutting down, the experimentation with the process variables, and the location and correction of difficulties was extremely valuable. Supervision for the starting up was provided by the contractor whose engineers and operators were not only highly competent but very cooperative and helpful in the training of the plant personnel.

The set went on the line in mid-November 1957, and remained in service until mid-April of this year with only brief interruptions of a minor nature. The estimated capacities were easily attained and the performance was satisfactory.

Performance

Table 1 shows the production and operating data for two typical rates of production. Column "A" contains data obtained while running at a reduced rate of 523 Mcf per hour, which is about 70 percent of full rate.

The data in Column "B" is for a rate of 770 Mcf per hour, the maximum rate for Philadelphia Electric Company sendout conditions, which were 801 Btu and 0.58 gravity until May 1958, when they were raised to 900 Btu and 0.59 gravity. It is entirely possible to produce more than 770 Mcf per hour, but at higher rates the uncracked methane and the specific gravity rise sharply, so that total sendout does not increase. Moreover, an increase in methane will be expensive, since over 80 percent of the sendout gas is natural gas mixed after compression in a high-pressure mixing station, and any additional methane in the carrier gas will mean increased pumping costs.

Peak Load Operation

During peak load operations, or periods of natural gas curtailment, the

TABLE 1.
West Conshohocken Gas Plant 13'-0" CCR Set Operation

Natural Gas Used for Combustion and Refining	"A"	"B"
Reformed gas produced		
Mcf per day	12,552	18,480
Mcf per hour	523	770
Btu, sat.	267	273
Specific gravity, sat.	0.490	0.509
Materials used per Mcf produced		
Total natural gas, cu ft (1045 Btu & 0.602 sp gr	295	298
Process steam, lb	9.88	10.94
Gas analysis		
% CO_2	5.0	3.2
% O_2	0.1	0.2
% CO	18.2	17.4
% H_2	51.5	54.2
% CH_4	4.3	6.3
% N_2	20.9	18.7
Sendout gas produced, Mcf per day		
At 801 Btu and 0.58 sp gr	44,640	63,720
At 900 Btu and 0.59 sp gr	76,080	106,200

TABLE 2.
West Conshohocken Gas Plant
13'-0" CCR Set Operation

Natural Gas Used for Combustion and Propane Vapor Used for Reforming	
Reformed gas produced	
Mcf per day	17,712
Mcf per hour	738
Btu, sat.	251
Specific gravity, sat.	.541
Materials used per Mcf produced	
Propane, (process) Mcf per hour	69.2
Natural, (heating) Mcf per hour	45.2
Steam, lb	17,373
Gas analysis	
% CO_2	7.3
% O_2	0.1
% CO	18.7
% H_2	53.2
% CH_4	1.8
% N_2	18.8
% Ill.	0.1
Sendout gas produced, Mcf per day	
At 801 Btu and 0.58 sp gr	56,040
At 900 Btu and 0.59 sp gr	95,736

CCR unit will use propane as process gas and may be fired with oil. Oil firing was done satisfactorily for two brief runs during the starting up period. Although the operation was satisfactory, the runs were not long enough for reliable operating and cost data.

Propane was used as process gas on three occasions during the past winter, with natural gas combustion. All three runs were of brief duration, the longest being 17 hours. The set operated very satisfactorily and was very easy to change over to propane operation. Table 2 gives data on the longest of the runs; the results, however, can not be accepted as conclusive.

A further use of propane to replace natural gas on this occasion was cold enriching with propane-air. This enrichment was added to the carrier gas, thus relieving the demand for natural gas at the mixing building.

This operation was necessary only to a limited degree for a few hours. The addition of larger quantities of propane-air in the carrier gas would have required an increase in gas sendout Btu to compensate for higher gravity and to maintain a constant heat input.

Conclusion

During the first winter of operation, the performance of this set was completely satisfactory. The quantity and quality of reformed gas produced were equal to the manufacturer's estimate, and were well suited to our sendout requirements. The set has been cooled down and inspection reveals no flaws in the lining or the shells. Other maintenance requirements are routine or minor in nature. In general, it was a very rewarding experience with a new piece of equipment during its first season of operation. * * *

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Shirtsleeves atmosphere prevails, but classroom work is intense at SGA Management Development sessions. Above, Dr. Edwin W. Mumma, University of Texas educator and associate director of the short course, lectures on "Essentials of Administration."

Coffee-break periods between classes are utilized fully by students at the short course for discussions on practices and problems brought out in lectures. Classroom work is supplemented by field trips to natural gas industry facilities.

SGA School Promotes Management Development

HOW CAN YOU HELP INDIVIDUALS BECOME BETTER MANAGERS IN THE NATURAL GAS INDUSTRY? One sure-fire method is to help them achieve a better understanding of the fundamentals of management within their industry. That premise has been the key to the success of the SGA Management Development Program, which completed its fifth annual session this summer.

Sponsored by the Southern Gas Association since 1954, the program, in five annual two-week sessions, has provided a closer insight to management practices for 160 supervisory and managerial personnel from natural gas companies operating in the Southern Gas Association region. Attending the 1958 session held on the campus of Texas College of Arts and Industries, Kingsville, Texas, were 34 men from 21 companies, representing 12 states.

Three topics formed the major part of the 1958 two-week course, supplemented by lectures on related subjects. They included, "Records, Reports, and Gas Economics," supervised by Dr. Joe E. Brown, Texas A & I; "Load Building," supervised by Dr. Frank H. Dotterweich, Texas A & I; and "Essentials of Administration," supervised by Dr. Edwin W. Mumma, University of Texas. Other lecturers included Dr. Joseph K. Bailey, University of Texas; Dr. J. C. Jernigan, Texas A & I; Rolland Storey, Houston Natural Gas Corporation; R. N. Papich, American Gas Association; B. Marshall Willis, El Paso Natural Gas Corporation, and Joe S. Davis, Southern Union Gas Company.

Daily sessions during the two-week Management Development Program begin at 8:30 a.m. and continue to 4:30 p.m. Luncheon meetings are conducted daily by class members, who give brief talks as part of their public speaking instruction. After dinner, seminars are held where questions and problems relative to the day's work are discussed with consultants.

During the weekend, midpoint of the course, the group takes an extended field trip. For the 1958 session, this included inspection of natural gas exploration, production, processing, transmission, and utilization facilities in the Rio Grande Valley area, with the group traveling by air-conditioned bus.

Other inspection trips during the 1958 course included visits to the Chemcel plant of the Celanese Corporation of America at Bishop, Texas, and a trip to the King Ranch. Supporting the inspection trips were films on natural gas production and transmission operations.

Activities of the registrants are handled in an organizational manner. The group elects class officers, and these men serve as a "board of directors" for the student group. At the close of the short course, highlighted by a luncheon meeting, each registrant receives a diploma, marking his successful completion of the intensive school.

Plans for each year's school are supervised by a standing Management Development Committee in SGA. Industry men who aided in development and supervision of the 1958 course included committee chairman, L. A. Bickel, Lone Star Gas Company, R. R. Suttle, SGA managing director; F. B. Haverfield and Thad B. Sanders, Transcontinental Gas Pipe Line Corporation; H. J. Lambdin, Mississippi Valley Gas Company; C. L. Morgan, United Gas Corporation; E. T. Robinson, Texas Eastern Transmission Corporation; Curtis M. Smith, Tennessee Gas Transmission Company; L. Proctor Thomas, Houston Natural Gas Corporation, and H. C. Webb, Oklahoma Natural Gas Company. Director of the course was Dr. Frank H. Dotterweich, Texas A&I.

Success of the program is evidenced in many ways. Each year's session has had a full quota of registrants (registration is purposely kept to a relatively small group to provide maximum benefits for those attending) and the companies sending their men to the annual short course have expressed full satisfaction with the results obtained.

Natural gas company personnel attending the annual sessions represent nearly every phase of industry operations, duties, responsibilities, and titles, in both engineering and operations. A brief statistical summary on the first five classes is given in the accompanying table. * * *

SGA MANAGEMENT DEVELOPMENT PROGRAM.

Statistics on Class Members

	Class of 1954	Class of 1955	Class of 1956	Class of 1957	Class of 1958
Number of students	29	31	32	34	34
Range of age, years	28–52	28–54	28–53	29–58	26–55
Average age, years	41.9	41.5	41.1	45.0	40.5
Education, avg. years	13.6	13.3	13.1	13.0	13.6
Industry experience, avg. years	17.4	15.0	16.8	19.1	17.9
Experience in one organization, avg. years	14.5	12.2	14.8	17.0	14.5
Number of states represented	11	11	11	15	12

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Profile by Gas Light

Ted Wolfe: Man of Action

FROM LEETSDALE, PENNSYLVANIA, to Baltimore, Maryland, the distance is only about 235 miles, but it represents a long trip for Baltimore Gas and Electric Company's dynamic President, J. Theodore Wolfe. Just turned 50, Ted Wolfe is the youngest president ever elected by the board of directors of the Western Hemisphere's oldest gas company.

Born in Leetsdale in 1908, Wolfe attended public school in nearby Sewickley and stayed in his home state for his college work at Penn State. He journeyed outside his native environs to study business administration at Harvard University Graduate School. This trip north to Massachusetts, oddly enough, started him on his way south to Baltimore.

After high school, young Ted helped his father paint houses. The pay was pretty small—sometimes nothing. After paying off the rest of the men, the elder Wolfe didn't have much left. It was a case of "family hold back."

One year of housepainting was followed by enrollment at Pennsylvania State University for a go at the finance and commerce curriculum. His major was economics, and along the way he picked up enough credits for an English major as well. The number of requests for his presence at the speakers' table reflect how well he mastered the subject.

At Harvard, the business administration curriculum required practical field work in a business establishment. Ted Wolfe was assigned to the Baltimore utility. He made such a hit that he was invited to return after he finished graduate work.

Graduation came in 1932 when just about everything else was at a low ebb. The offer from Baltimore looked mighty good and Pennsylvania lost a resident while Maryland gained one. Neither Ted Wolfe nor Maryland has ever regretted the change.

The drive and initiative behind his soft voice and relaxed manner characterized all of Ted Wolfe's career. From methods investigator to staff assistant in the executive offices; to assistant vice president to vice president to executive vice president to president in just 25 years. And, no one in his firm seems surprised that he made it.

Ted Wolfe

Staunch believer in people and their abilities, he has a fierce pride in the more than 8000 employees at Baltimore Gas and Electric. Nothing pleases him more than a friendly "Hi, Ted!" tossed his way at a company dance or bull roast. Whenever there is a crisis in his firm, be it hurricane, snowstorm or the like, Ted Wolfe is always first to praise the work of the men and women of his organization—and they don't let him down.

Anyone who wants to call the president (or any other officer for that matter) may do so. One of Baltimore Gas and Electric's bedrock policies is the "open door." It isn't empty phraseology, either. J. T. Wolfe believes in answering his own telephone. Requests for approval or a decision are handled promptly. Ted Wolfe can ask penetrating questions but he wastes no time in haggling.

The philosophy that governs the thinking of people at Baltimore Gas and Electric has been summed up by Wolfe: "Our mission in life is to furnish gas, steam, and electricity at the lowest rates possible that are at the same time consistent with good service to our customers, proper compensation to our employees, and a fair return to the investors of our company." This idea of how to do business is translated into practice and operations are measured against it.

People in the gas business who have worked with Ted Wolfe know him as aggressive and forthright. The A.G.A. has known him as a second vice president; member of the board of directors and executive committee; chairman of the important Gas Industry Development Committee; chairman of the Executive Safety Committee and, this October, he becomes its president. He is a staunch advocate for upgrading of gas appliances, lowering of costs, and giving the best value to customers. He stands for progress—for the exploration of new, fresh avenues that will lead to increased gas sales—and he has no time for "just talking" about things to do.

Like most men of action and leadership, Ted Wolfe is called upon for guidance by his community. He is a director of four enterprises in Baltimore as well as of the Edison Electric Institute. Outside of business he is on the boards of two schools, is a spark plug for the Community Chest-Red Cross United Appeal, was a member of the Commission on Administrative Organization of the State of Maryland, past president of YMCA, and a string of others.

A religious man who works at it, Wolfe is an Elder in the Second Presbyterian Church; former Vice Moderator, Presbytery of Baltimore; former member Executive Committee, National Council of Presbyterian Men.

With his wife and two teen-age youngsters, Ted Wolfe enjoys getting away when he can to the Poconos where he owns a cottage at Buck Hill Falls. There he can golf, swim, smoke his pipe, and relax. Let something important develop at Baltimore Gas and Electric, however, and Wolfe is right on top of it in short order.

The Baltimore utility is facing an expansion program that will cost about $270,000,000 over the next five years. While the bulk of this figure will go into the electric side of the business, gas use—particularly for home heating—is increasing and many miles of new mains and other facilities are being installed to meet the demand and to anticipate growth. Ted Wolfe, with his usual vigor, is building on the solid foundations of the past for an even greater future. Says Wolfe, "the business is there—let's get it."

"Parade of Progress" Show Highlights A.G.A. Meeting

NEW, EXCITING, AND SIGNIFICANT DEVELOPMENTS in gas appliance and utilization technology, plus a "Parade of Gas Research" and a "Parade of New Freedom Gas Kitchens and Laundries" will highlight the 40th annual convention of the American Gas Association October 13-14-15 in Atlantic City.

Educational rather than promotional in nature, the *"Parade of Gas Progress"* exhibits will display gas utilization items that have become commercially available since October 1956 (or soon to become commercially available), and "prototypes of important new utilization devices still under development.

"Parade of Gas Research" exhibits will demonstrate how projects are originated and developed in the laboratory and manufacturers' displays will show how these research ideas are carried to the customer as products.

Technical advances to be shown include: Residential and commercial gas air conditioning; gas refrigeration; new gas range broilers using the Schwank infra-red burner; a remote control, push-button gas range; new-type top burner controls; fold-down gas burners; a new meat thermometer; gas lamps; school room heaters; high-speed gas burners for hotel and restaurant ranges, and other items demonstrating developments in residential, commercial, and industrial appliances and equipment.

"Parade of New Freedom Gas Kitchens and Laundries" exhibits to be shown have been designed by leading shelter magazines in cooperation with cabinet manufacturers.

Included in the exhibits will be A.G.A.'s dramatic new Multimatic Wall, which combines gas cooking, laundering, refrigeration, water heating, and house heating in one compact unit.

The exhibits will be the first at an A.G.A. annual meeting since 1952.

"A Greater America" is Meet Theme

All utilization exhibits, general sessions, luncheons, and section meetings will dramatize the convention's overall theme, "Gas Builds A Greater America." General session themes are *"What's Ahead"* on October 13, *"Problems to Think About"* on October 14, and *"Meeting Our Opportunities"* on October 15. Theme for the general luncheon that climaxes the convention on October 15 will be *"A Time for Greatness – Making the Most of Our Opportunities."*

A.G.A. President Robert W. Otto, chairman of Laclede Gas Company, will open the convention October 13 with an address on "Gas Builds a Greater America." Other speakers programed for the first general session are Martin R. Gainsbrugh, chief economist National Industrial Conference Board; Fulton Lewis, Jr., Mutual Broadcasting System commentator, and James J. Healy, associate professor of industrial relations at Harvard University.

Nine Awards Slated

A.G.A's Distinguished Service Award and eight other types of achievement awards will be presented during the convention. Included are the Distribution Achievement Award, the Beal Medal for the best technical paper presented at an A.G.A. meeting during the year, Operating Section Award of Merit, the Order of Accounting Award of Merit, the Safety Achievement Awards, A.G.A. Home Service Achievement Awards, the Industrial and Commercial Achievement Award, and the Public Relations Achievement awards.

All five A.G.A. sections will meet during the convention. Section headquarters will be located in the following hotels: Accounting, Sheraton-Ritz Carlton; General Management, Dennis; Industrial and Commercial Gas, Traymore; Operating, Claridge; and Residential Gas, Traymore.

Home Service has slated an afternoon round-table session for October 13 at the Hotel Traymore, and the an-

the infra-red radiant heater that HEATS LIKE THE SUN

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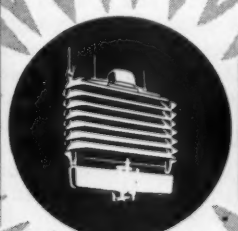

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nual Home Service Breakfast will be held the following day, also at the Traymore. Mrs. Betty M. Rush, home service supervisor of Baltimore Gas and Electric, and chairman of the home service committee, will preside.

Accounting section sessions are docketed for October 13 at 2 p.m. and for an Ocotber 14 12:30 luncheon, at which the Order of Accounting Merit Award will be presented. C. F. Mills, general accounting manager, Philadelphia Electric Company, and coordinator of the section's general activities group, will preside at the first session.

L. J. Rauh of Baltimore Gas and Electric, chairman of the customer activities group, will preside at the luncheon.

Industrial and Commercial Gas section members convene for an afternoon meeting October 13 at the Hotel Traymore. Roy E. Wright, director of gas and electric sales, NEGEA Service Corporation, and section chairman, will preside at the meeting.

Operating section afternoon sessions are slated for both October 13 and 14 at the Hotel Claridge. The section will also present an exhibit on standard purchase specifications for small diaphragm-type gas meters meeting new A.G.A. standards. The Operating Section Award of Merit, the Distribution Achievement Award, and the Beal Medal will be presented during the afternoon meetings.

Residential Gas section will meet October 14 at 2 p.m. in the Hotel Traymore. Presiding as section chairman will be A. G. Bur, vice president, Wisconsin Public Service Corporation. Program will include presentation of Home Service Achievement awards, and introduction of the newly crowned Mrs. America, Mrs. Helen Giesse of Cleveland.

Wolfe Heads Nominee Slate

Delegates to the convention will elect four general officers, 15 directors, and 11 chairmen and vice chairmen for the association's five sections. The nominees include:

General Officers

President—J. Theodore Wolfe, president, Baltimore Gas and Electric Co.; **First vice president**—Wister H. Ligon, president, Nashville Gas Co.; **Second Vice President**—L. T. Potter, president, Lone Star Gas Co.; ***Treasurer**—Vincent T. Miles, treasurer, Long Island Lighting Co.

Directors (2-year term to October 1960)

Eskil I. Bjork, chairman, The Peoples Gas Light and Coke Co.; *Everett J. Boothby, president, Washington Gas Light Co.; H. Donald Borger, president, The Peoples Natural Gas Co.; *Orville S. Carpenter, president, Texas Eastern Transmission Corp.; *Marvin Chandler, president, Northern Illinois Gas Co.; *Carl E. Cloud, president, MidSouth Gas Co; Charles H. Gueffroy, president, Northwest Natural Gas Co.

Also, William G. Hamilton, Jr., president, American Meter Co.; W. J. Harvey, vice president, Public Service Electric & Gas Co., New Jersey; *Robert A. Hornby, president, Pacific Lighting Corp.; A. W. Johnston, vice president, Boston Gas Co.; *Walter T. Lucking, president, Arizona Public Service Co.; E. Clyde McGraw, president, Transcontinental Gas Pipe Line Corp.; E. A. Norman, Jr., president, Norman Products Co.; Gustav F. Watters, vice president, Niagara Mohawk Power Corp.

Section Officers

Accounting Section: Chairman—J. Gordon Ross, Rochester Gas & Electric Corp.; Vice chairman—C. H. Mann, Columbia Gas System Service Corp.

General Management Section: Chairman—Marvin Chandler, Northern Illinois Gas Co.; Vice chairman—Otto W. Manz, Jr., Consolidated Edison Co. of New York.

Industrial and Commercial Section: Chairman—F. Thompson Brooks, Philadelphia Electric Co.; Vice chairman—Fred A. Kaiser, Michigan Consolidated Gas Co.

Operating Section: Chairman—Herbert C. Jones, New England Electric System, Gas Division; Vice chairman—J. T. Innis, Northern Natural Gas Co.

Residential Gas Section: Chairman—Thomas H. Evans, Equitable Gas Co.; Vice chairman—H. William Doering, Springfield Gas Light Co.

*Renominated.

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- CA 160 Mastic
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- No. 170 Coal Tar-Resin Tape

CA 160 MASTIC

A solvent release, cold applied coating designed to fom a heavy bodied film on one application. Has excellent wetting characteristics . . . requires no stirring and no primer. CA 160 is ideal for underground coating of steel pipe, tanks and similar equipment.

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A plasticized coal tar enamel containing polymerized synthetic resins and reinforced with a woven glass fabric. No. 140 Tape is a tough, elastic like coating. It is easy, safe and economical to use for any application requiring a prefabricated coating.

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The same material as No. 140 without the glass reinforcement. The outstanding feature of No. 170 Tape is its ability to conform to irregular surfaces. The rubber-like Tape is self-healing, has high dielectric strength and provides a coating of the highest quality.

A Protecto Wrap representative will be glad to demonstrate these new products for you. Simply contact one of the offices listed below.

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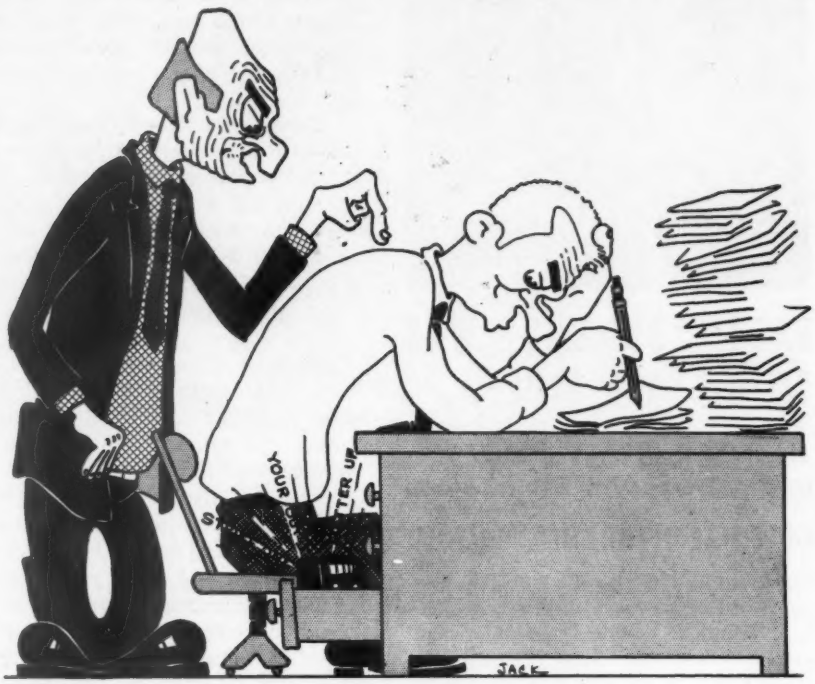
Office Work Overloads . . . How To Eliminate Them

Ernest W. Fair



ONE of the biggest headaches for plant executives and employees alike is that over-load of work that crops up all too frequently and disrupts the well planned office routine. It generally leaves everyone disgusted, tired, and ready for the annual vacation.

Some of these occur because of external conditions that cannot be avoided, or which no amount of planning can forestall. They are, however, few in number; most can be avoided.

Any step that accomplishes such an end is fully justified in the extra planning needed to avoid such unpleasant over-load periods. The return in virtual elimination of costly errors and mistakes, elimination of ruffled nerves, and a day-in and day-out smoother operating organization is well worth such extra planning.

We've checked into methods used by several score organizations of every size and type to ascertain how they avoid such work over-load periods. The results are presented below and feature suggestions that can be used in every office whether the staff be a single employee or a score.

Find the Causes. This suggestion was made by almost every executive contacted. They pointed out that little can be done until each such period that occurs is "taken apart and examined in minute detail" for its causes. In many cases the revelation of such causes will lead to easy steps in solving the problem; usually their existence is never apparent until a diligent search is made for them.

Procedure to follow when such causes have been determined is to spend maximum effort on those occuring most frequently and responsible for the greatest part of the work over-load. Handling the small factors usually does little to prevent the occurrence of another such over-load period almost immediately. Forestalling even one of the major causes can result in wide spacing between their occurrence and give the staff an opportunity to work out solutions for other factors that affect the over-all problem.

Use More Equipment. In many situations work over-loads have been caused by the inability of the staff to keep up with a slight increase in volume of work. Usually such volume seldom justifies adding to the staff.

Searching out procedures and methods whereby more machines and equipment can be used to handle chores now being performed by men and women on the staff can often remedy the work over-load problem. Modern equipment has much greater flexibility than humans. Often such equipment can handle as much as a 25 per cent over-load without affecting normal office routine, an amount that would create a tremendous problem if every step had to be handled manually.

Many firms with such frequent work over-load problems have found them solved by simply calling in the consultants of such equipment manufacturers and having them attack the problem.

The equipment cost must, of course, be balanced against its value in eliminating present work over-loads as well as helping to avoid even greater over-loads in the future.

Checking Employee Efficiency at periodic intervals often helps to solve the problem. A number of such situations have been remedied when it was found the over-loads were being caused by lack of efficiency on the part of a single staff employee. Others have found shifting jobs among the staff resulted in greater efficiency at each individual spot. Many such over-loads, from the group, department or staff standpoint, are caused by "bottlenecks" within that segment of the staff. The elimination of one such "bottleneck" will often solve most such over-load problems.

In a few instances this has meant replacement of one or more individuals who lacked speed or efficiency at their jobs, re-assigning certain portions of the work load to divide it more equally among the staff and re-assigning differ-

FAST, LOW-COST WAY TO INSTALL PIPE . . .

push it under streets, roads, tracks, lawns with a timesaving

GREENLEE HYDRAULIC PUSHER

Speed underground piping jobs this way. GREENLEE Pusher is one-man-operated (by hand or with power pump), portable, simple to set up and use. No tearing up of pavement, floors, lawns . . . does away with extensive ditching, tunneling, backfilling, repaving. GREENLEE Pusher cuts job time to a fraction . . . often pays for itself on first job.

Two feet per minute average pushing time

GREENLEE Pushers are available in two sizes: No. 790 for ¾" to 4" pipe . . . No. 795 for pipe over 4", concrete sewer pipe, large ducts. Average performance of No. 790, shown above with power pump, two feet per minute. Write for literature.

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ent functions to provide the greatest capability from each individual involved.

Shifts in Normal Routine Work often make it possible to handle such peaks without disruption of the office routine. Several organizations have found that a number of segments of the routine work done therein could be held over until after the peak load has been passed. In such instances, individuals who normally handled such work were trained in phases of other office routines where loads commonly appeared in the past. Then, when one of these arose, they set aside their routine tasks to take over a portion of the load.

Creating a "Peak Load" Staff is a new method being developed by a number of concerns very carefully. Under it, men and women who do not desire full-time work are sought out and trained for specific jobs needed in handling such heavy work-load periods. They are called upon only when these occur.

Sources of such individuals have been employees who have left the firm (and are acquainted with its routines) and retired from work such as women who left to get married, have babies, etc. Also, individuals with skill and experience who have retired on social security and now find time heavy on their hands. The latter group offer an excellent potential for creation of such a staff since they cannot hold full-time jobs and draw their social security checks.

Usual procedure is to create such a list of approximately twice the depth that will be needed since individuals on such a stand-by basis may not always be immediately available on short notice.

Elimination of Accumulated Loads has been going on for a long time in many industries. The idea offers possibilities in almost every type of work that builds up to a peak at a given time each month. Examples have been in staggered billing by utilities and department stores on accounts with some on the 10th-20th-30th of each month rather than all on the 1st. Keeping day to day tallies and totals rather than monthly figures is another.

Whenever and wherever over-load periods are caused by such accumulations it can often be found that a solution will lie in breaking up these accumulations into smaller units . . . thus a 30x load handled once a month can be reduced to a 10x load handled three times monthly or even 1x on a daily basis so that the load is eliminated without adding seriously to the normal work routine of the staff at any given time.

Reducing Paper Work Involved often helps to cut down the mass total of such work over-load periods. Some firms have found the major cause was in the use of forms of great length and detail that were needed on only about 5 per cent of the work and that still had to be handled for the other 95 per cent. In this case development of a "long" and "short" form helped to solve the problem.

In others, reduction of the size of forms has helped cut down the amount of time needed to handle each and thus permitted more to be handled by each individual during every hour . . . and so reduced pile-ups that resulted in frequent work over-loads.

A close examination of the systems used in every step of procedure will often unearth such possibilities. It is universally recognized that one cause of frequent over-loads is time wasted in handling each individual piece that contributes to the load. Whenever a slight additional increase in volume occurs, it strains the ability of the staff to handle that increase and the over-load develops.

Elimination of "Deadwood" both in the human and mechanical equation has often provided a solution to the problem. In one office, a check noted a decreased work output per stenographer during the afternoon period as compared with the morning. The executive in charge realized that all of his work over-load periods could be solved if the afternoon periods could be made as productive as the morning periods. In this case it was solved with adoption of electric typewriters. The machines eliminated the fatigue factor.

The same procedure applies to the human element in the organization. Sometimes such over-loads are caused by below par efficiency on the part of one or more staff members. When they are replaced, the slack is picked up and pile-ups seldom occur.

The foregoing causes of work over-load periods have been those occurring most frequently and which can be found in almost every office where such a problem exists. This does not mean, however, that other causes pertinent to the individual system of operation will not exist and be of equal importance. In almost every such case, individual factors existed in equal proportion to those found generally.

Close examination of each work over-load period and a diligent search for the exact causes that created the situation is the first step to follow. In some instances these causes can be "unearthed" more readily and with greater accuracy by an outsider since our closeness to the situation may lead to overlooking these conditions. * * *

Civic "face lifting" usually means work for distribution construction crews. In downtown Brooklyn, the Kings East Street Section crew of Brooklyn Union Gas Company cut out, capped, and later replaced a 10-in. gas main to allow installation of a new water main, in conjunction with improvements on and widening of Adams Street. Photo shows crew at work in foreground; at right foreground is crew's compressor truck. At left is new Supreme Court Building, one unit in large-scale downtown civic center development now underway.

"WHERE GAS IS GROWING"

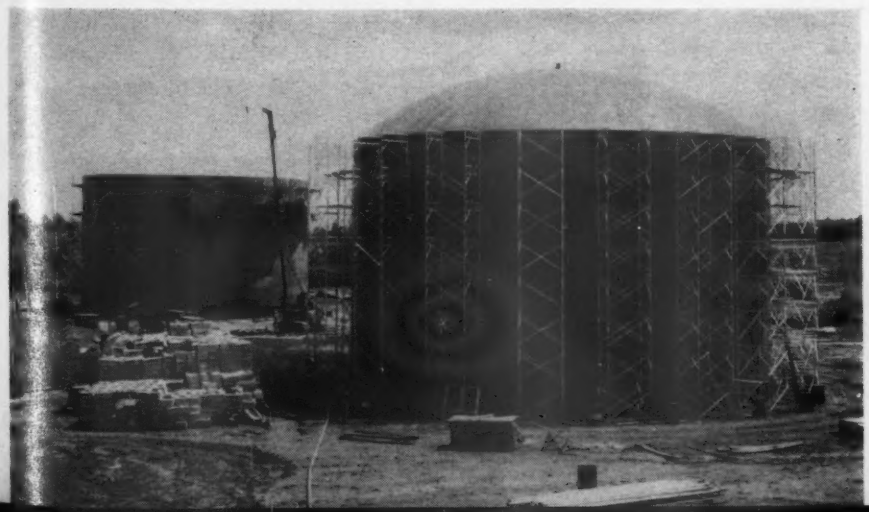
Distribution Developments

NEWS ABOUT CURRENT AND PLANNED CONSTRUCTION

Tidewater Natural Gas Company, Wilmington, North Carolina, has embarked on a $3,500,000 program to serve five cities in the southeastern corner of the state. Some 200 miles of pipe are to be laid in the five-city area of Wilmington, Fayetteville, Kinston, New Bern, and Washington, and existing systems in the area will be converted from propane-air to natural gas. The program includes 24,000 ft of 16-in. mains, 39,000 ft of 12-in., 32,500 ft of 10-in., 22,800 ft of 8-in., 98,600 ft of 6-in., 61,400 ft of 4-in., 350,000 ft of 2-in., and 205,000 ft of ¾-in. services. Contractor on the entire installation is C. N. Flagg & Company, Meriden, Connecticut, and Charlotte, North Carolina. Conversion to natural gas will be carried out by Utilities Conversion and Engineering Company of Minneapolis, Minnesota.

Huntsville Gas System, Huntsville, Alabama, plans completion in December of an extensive distribution system in its area that includes installation of 40,000 ft of 4-in. intermediate pressure main; 70,000 ft of 2-in. intermediate main, and 200,000 ft of 1-in. service lines. The 1 and 2-in. work is being done by company crews, and the 4-in. work by contractors.

Kansas-Nebraska Natural Gas Company, Inc., Hastings, Nebraska, has completed work on two new distribu-



♦ **Rising skyward,** two more refrigerated LPG storage tanks, each of 1,291,000 gal capacity, join a similar unit at the Riverdale Plant of Atlanta Gas Light Company, where the method of storing LPG at —50 F was pioneered. Work is part of a $1,748,000 program that will increase company's LPG storage 75 percent — to 8,676,000 gal — for the 1958-59 heating season, enough to make an equivalent of 781,000,000 cu ft of natural gas.

Five new service trucks, designed for safety, mobility and crew comfort. . .

have been added to its fleet by the Gas Department of Cincinnati Gas & Electric Company. Conventional enclosed body trucks are of the "cab-over-engine" design with shorter wheel base. This allows addition of a useful rear platform, making it unnecessary for men to step into traffic when leaving the truck.

Sliding doors save space and improve safety and comfort. Storage space for boots and raincoats, as well as bins for welding equipment, kerosine, water hose, tools, and supplies are provided in the truck body. Crew comfort is also enhanced by side and rear windows and a heater.

Pipe, formerly carried on the roof, is now kept on the sides and can be unloaded by a man on the ground. With their ease of handling in traffic and easy maneuverability, the new trucks have met with enthusiastic reception by company crews.

tion systems. In Utica, Nebraska, company crews laid 6250 ft of 2-in., 17,000 ft of 1¼-in., and 3000 ft of 1-in. mains and services, all low pressure. In Waco, Nebraska, company crews have installed a new low pressure system that includes 2950 ft of 2-in., 8600 ft of 1¼-in., and 2900 ft of 1-in.

Iowa Southern Utilities, Centerville, Iowa, is currently working on, and plans to complete by late November a program of extensions and replacements to its medium and low pressure system in Burlington, Mt. Pleasant, Washington, Grinnell, and Centerville. The projects include installation of 1250 ft of 8-in., 20,416 ft of 4-in., 5423 ft of 3-in., 4700 ft of 2-in., 60,000 ft of 1¼-in., and 9000 ft of 1-in. For new services, the company installs 1¼-in. lines on low pressure and 1-in. on intermediate pressure. Local company crews at each location are performing the work. Company also has applications before FPC to serve eight other cities it its area.

WANTED: News and photographs about your company's construction work. Working on an interesting or unusual gas main project or highway relocation job? Added new construction or service equipment or vehicles? Tell us — and the industry — about it. Send your photos and news items to *Distribution Developments Editor,* AMERICAN GAS JOURNAL, *P.O. Box 1589, Dallas 21, Texas.*

Branding Time

Time to "Tally the Herd" and "Round up the Strays".

Gas companies, nationwide, profitably use Southern Cross Foresters gas leak "Round-up" services . . . leak location surveys and when needed, fully equipped fully trained repair crews.

SOUTHERN CROSS FORESTERS

Atlanta 6, Ga. MElrose 4-4227

Mr. Lewis Parley who operates a Sherman Power Digger for the Hood Construction Co. of Los Angeles, Calif. says, "I have been a backhoe operator for six years and in that time have run several different makes, but I have never run one as good as the "F" Sherman."

If You Excavate... What These Men Say About Sherman Diggers Is Important

When it comes right down to it, the men who own and operate power diggers day after day are the ones who really know how such units perform and how they stand up.

That's why the comments of these typical Sherman Power Digger operators are important to every excavator. They prove the Sherman saves you money for two reasons: First, the Sherman digs faster, completes jobs quicker. Second, the Sherman is so rugged and dependable that downtime is kept at a minimum.

Prove to yourself the Sherman is your best buy—"Clock it" on your own job—without obligation. At the same time, check the many exclusive features that *keep the Sherman out of the repair shop and "on the job."*

Write today for Bulletin No. 3176.

Mr. E. L. Shaner handles an "F" Sherman Power Digger for contractor E. A. Irish at a new subdivision in Laguna Beach, Calif. He says, "I have run them all and I like the Sherman best. It is easier handling. For instance, if I am sitting on a bank, I can swing up-hill—something you can't do with some of the other rigs. They just won't do it. And the Sherman has a full 90 degree swing both ways."

Sherman Products

SHERMAN PRODUCTS, INC., Royal Oak, Michigan

POWER DIGGERS • LOADERS • FORK LIFTS

SOIL WORKING TOOLS • CRANES AND EXCAVATORS

In Seattle, Mr. Sam English, one of the owners of Excavators, Inc., reports a saving in money on a utility contract because the Sherman undercuts eight feet unbroken sections of pavement, thus eliminating expensive handwork. He says, "The maneuverability, efficiency and economy of the Sherman make it the best digger I have seen."

Mr. L. L. Donaghue and Mr. Vernon O. Lippoldt, co-owners of the D & L Ditching Service of Haysville, Kansas, say, "The Model "F" is our fifth Sherman digger and if we were going to buy a digger tomorrow, it would be one just like this one. We already have 275 hours on it and have yet to tighten a bolt."

NEWS

ABOUT THE GAS DISTRIBUTION INDUSTRY

Cooking with Gas heralds rapid construction of new 21-story East Ohio Building in downtown Cleveland. East Ohio Gas Company will occupy first eight floors, so workmen — on thier own — marked windows with the slogan instead of usual "X" to indicate glass is in place. The new building, featuring gas heating and cooling, along with a glass facade, will be ready early in 1959.

How gas industry's safety program is paying off will be highlight of the gas industry group's part of the public utilities section's sessions of the National Safety Congress, October 20-24, Chicago. Speakers include: R. N. Papich, A.G.A. safety consultant; S. M. Foeller, superintendent of transportation, Michigan Consolidated Gas Company; M. B. Travis, safety engineer of Northern Natural Gas.

Rexall Drug Company has purchased Chemtrol Company of Lynwood, California, a manufacturer of a complete line of plastic non-corrosive valves. These plastic valves will complement the plastic pipe and fittings products manufactured by Kraloy Plastic Pipe Company, also a Rexall subsidiary. Martin Usab, designer of the valve and principle of Chemtrol, will head the research and product development department of the combined companies.

Voters verified they liked Iowa-Illinois Gas and Electric Company's services by approving a new 25-year gas franchise by a margin of 21 to 1 in a special election held August 12 in Davenport, Iowa.

Randall T. Klemme, Northern Natural Gas Company's director of marketing, economic research and area development, was one of five American economists invited to address the International Congress for Regional Economy at Ostend and Brussels, Belgium, September 7-12.

Washington Natural Gas Company has asked SEC approval of issue of 100,000 shares of common stock. Proceeds are to be used to retire bank loans made for construction of new mains and services in the Seattle-Tacoma area and other areas not now served. WNG expects to spend $5 million in 1959. 1958 construction amounted to approximately $4,400,000.

On Its Way

Check for $52,246,425 is delivered to The Houston Corporation's senior vice president, Theodore Rinehart, by Eugene Bashore, senior vice president of Blyth & Company, (left, seated) as F. E. Stanley (left, standing) president, and W. J. Bowen, senior vice president, both of Houston Corporation, look on. Money is for construction of a 1500-mile Texas-to-Florida gas pipeline by Houston's two pipeline subsidiaries.

Peter Flagg, (left), president, C. N. Flagg and Company construction firm, and Clifford B. Ewart, president, Tidewater Natural Gas Company of Wilmington, North Carolina, sign contract for installation of 200 miles of distribution mains and lateral lines in a five-city region of North Carolina, a $3,500,000 project.

GAMA cites several favorable factors—particularly industry's increasing attention to heating and ventilating problems—as responsible for gas-fired heavy-duty forced air heaters' fast growth in the heating industry. In establishing a new division this year for heavy-duty forced air, GAMA defined such equipment as direct-fired heaters, or heat diffusers, with capacity in excess of 500,000 Btu per hour output used for comfort heating, or in buildings having a wide expanse of open space or where rapid air changes are likely to occur.

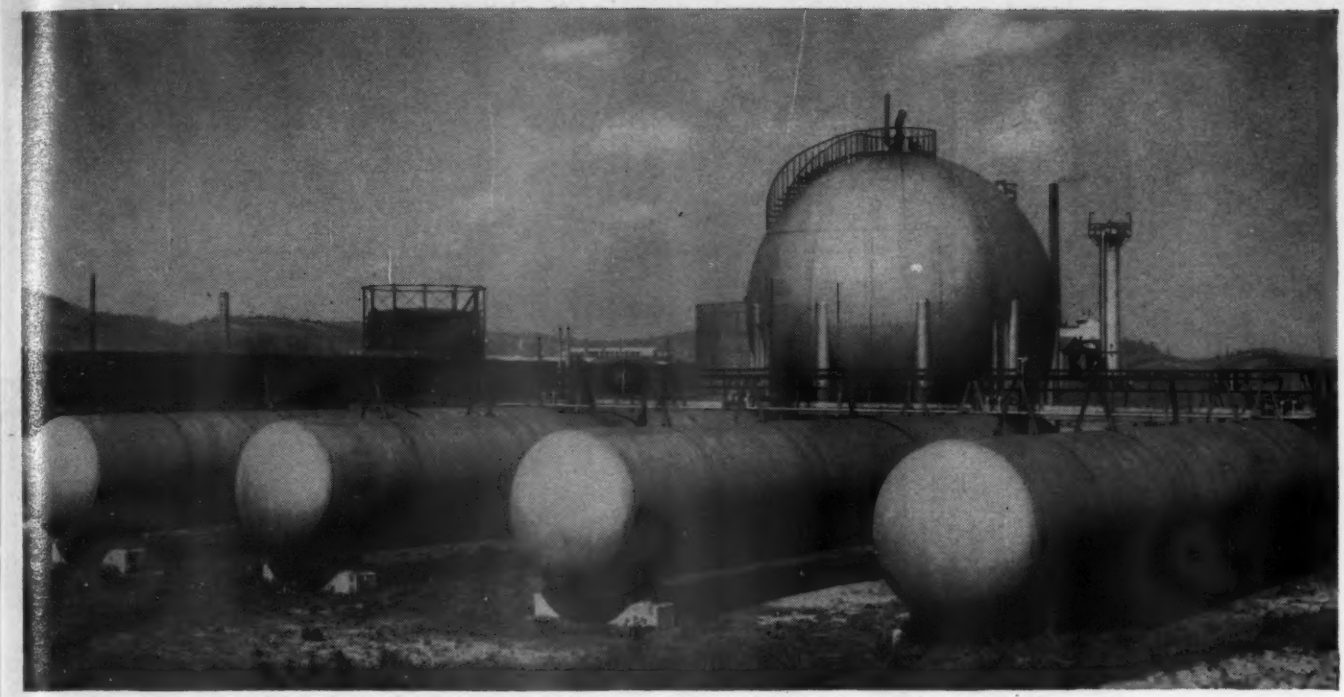
Facts and Figures

JULY WAS A GOOD MONTH for gas appliance shipments. "Strong gains" were registered by water heaters and central heating equipment. Forced warm air furnaces were up 18.6 percent over year-earlier totals, gravity-type furnaces were up 9.9 percent, and gas-fired boilers shipments increased 16 percent. Gas ranges, still below 1957 figures, showed some improvement with built-in range shipments up 18.9 percent while free-standing ranges were down 6.7 percent, for total decline of 10.2 percent from 1957. Conversion burner shipments decreased 23.7 percent. Bright spot was automatic water heaters, 13.6 percent higher than year-ago. Gas clothes dryers were up 9 percent over June this year, 14 percent over July last year.

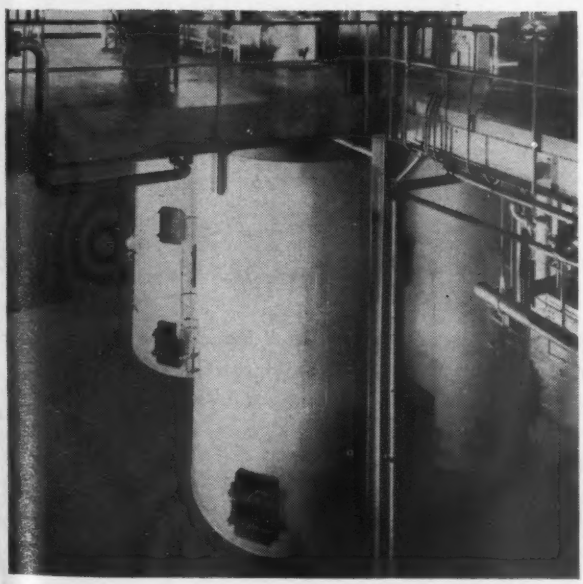
INDUSTRIAL FURNACES UP TOO. Net new orders for industrial furnaces, totaling $5,169,000, was 29 percent from June. July was the best month for the industry in 10 months, and the only month in which business exceeded $3 million since September of last year. However, business for the first seven months of 1958 amounted to $22,971,000, a decline of 52 percent from the $47 million volume in the same period of 1957.

Gas stocks prices set new 1957-1958 record during July when they closed at an average price of $44.47 a share. Total industry natural gas common stock prices were nearly one percent higher than June and 7.6 percent above average prices a year ago. Average dividend of $1.99 was 4.2 percent greater than a year ago. Stock prices of the 10 distribution companies included in the A.G.A. Index hit an all-time high of $33.93 a share at the end of July, up 21.0 percent from a year ago. Dividends increased from $1.49 last year to $1.54.

In an overall upturn of construction in July, residential contracts amounted to $1,557,443,000 showing a 21 percent increase over July of last year. Construction contracts in the U. S. for all categories totalled more than $3.6 billion, a gain of 24 percent over the same month of 1957. July is the second highest of the last three month's record breaking spurt. F. W. Dodge Corporation, construction news and marketing firm reports, ranked June first, July second, and May third. In the residential upturn, increase in apartment building contracts, up 44 percent, continues to lead, but contracts for one- and two-family units also rose in July by a substantial 18 percent.



Gas production facilities by United Engineers—to handle current and projected peak loads economically



If your planning shows a demand curve rising above your production capacity in the near future, the time to call in experienced counsel is right now. The long experience of United Engineers in designing and installing gas production equipment of many types and capacities can be of practical service to you.

After careful study of your equipment and your estimated gas production requirements, we may recommend modification of existing gas equipment or installation of new units. A reliable L.P. gas plant may well be the answer to your needs . . . a high Btu oil gas apparatus . . . or you may want the flexibility, high capacity, and economical operation of a U.G.I. Cyclic Catalytic Reforming (CCR) Unit.

The experience of 70 years' service in the gas industry is at your disposal in developing facilities to meet demand. And our many new assignments from clients previously served is your assurance of maximum return for each dollar expended.

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& Constructors Inc

U.E.&C. (Canada) Ltd.

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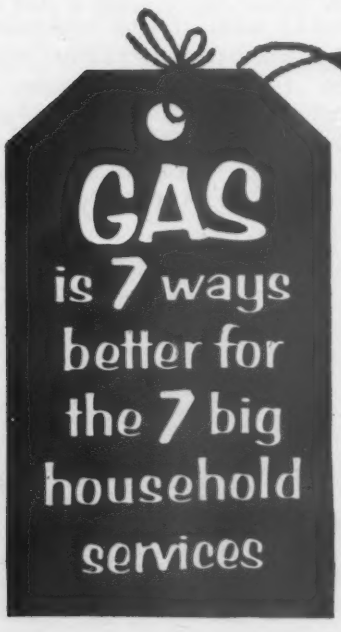
GEM TELLS MILLIONS OF READERS

SELLS MILLIONS OF HOME OWNERS

THE COMFORT AND CONVENIENCE OF GAS FOR THE 7 BIG HOUSEHOLD SERVICES

Suppliers to the Gas Industry Build a Brighter Future for Themselves *and for their Customers.*

These 13 Manufacturers supplying equipment to the Gas Industry sell more Gas to homeowners by investing in national advertising in The Saturday Evening Post, New Homes Guide and Home Modernizing.



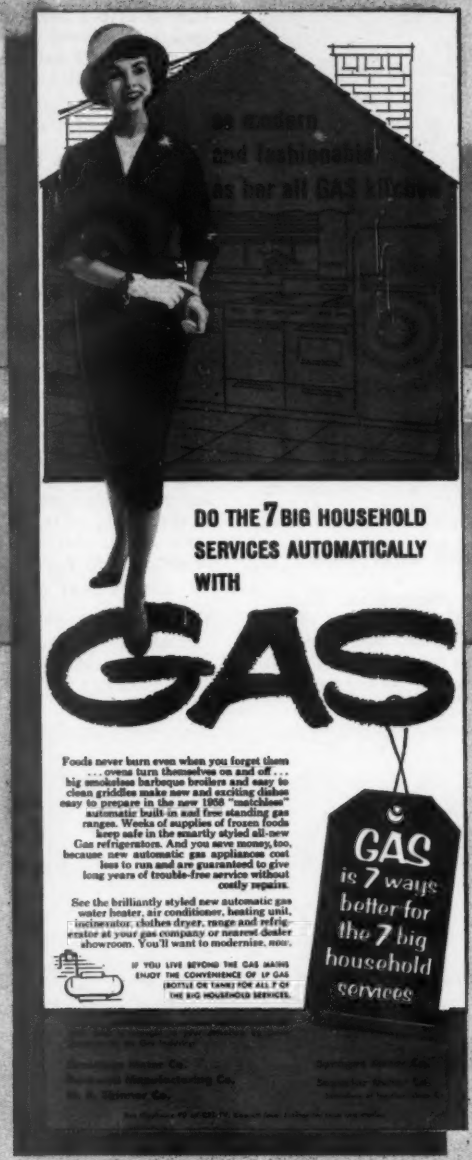
American Cast Iron Pipe Co.
American Meter Co.
Bastian-Blessing Co.
Cleveland Trencher Co.
Dresser Industries, Inc.
Fisher Governor Co.
E. F. Griffiths Co.
Rockwell Manufacturing Co.
M. B. Skinner Co.
Sprague Meter Co.
Superior Meter Co.
Subsidiary of Neptune Meter Co.
U. S. Pipe and Foundry Co.
Vulcan Rubber Products
Division of Reeves Brothers, Inc.

GEM appliance price tags, sold for only $10 per thousand, tell and sell on the display floor.

See Playhouse 90 on CBS-TV.

GEM National advertisements like these
SELL MORE GAS FOR YOU

SPRING
SUMMER
FALL
ALL YEAR 'ROUND COMFORT WITH
GAS
DEPENDABLE AIR CONDITIONING AND HOME HEATING
No wonder 8 out of 10 new home builders choose Gas for home heating and more and more home buyers and home modernizers are installing Gas air conditioning. Gas is so clean it cuts redecorating costs way down — so automatic and carefree you don't even have to order the fuel. And Gas is more economical, too — costs less to buy, less to install, and less to operate year after year.
Ask your Gas company, heating and plumbing contractor, or your appliance dealer how little it costs to enjoy year 'round comfort in your home with Gas air conditioning and automatic home heating.
IF YOU LIVE BEYOND THE GAS MAINS ENJOY THE CONVENIENCE OF LP GAS (BOTTLE OR TANK) FOR ALL 7 OF THE BIG HOUSEHOLD SERVICES.
GAS is 7 ways better for the 7 big household services


DO THE 7 BIG HOUSEHOLD SERVICES AUTOMATICALLY WITH
GAS
Foods never burn even when you forget them . . . ovens turn themselves on and off . . . big smokeless barbeque broilers and easy to clean griddles make new and exciting dishes easy to prepare in the new 1958 "matchless" automatic built-in and free standing gas ranges. Weeks of supplies of frozen foods keep safe in the smartly styled all-new Gas refrigerators. And you save money, too, because new automatic gas appliances cost less to run and are guaranteed to give long years of trouble-free service without costly repairs.
See the brilliantly styled new automatic gas water heater, air conditioner, heating unit, incinerator, clothes dryer, range and refrigerator at your gas company or nearest dealer showroom. You'll want to modernize, now.
IF YOU LIVE BEYOND THE GAS MAINS ENJOY THE CONVENIENCE OF LP GAS (BOTTLE OR TANK) FOR ALL 7 OF THE BIG HOUSEHOLD SERVICES.
GAS is 7 ways better for the 7 big household services

All suppliers are needed...

to participate in the GEM program for protecting present profits and insuring future Gas Industry growth. To do your share, ask any GEM sponsor or write Gas Equipment Manufacturers Group, c/o Gas Appliance Manufacturers Association, 60 East 42nd Street, New York 17, N. Y., for information about participation in Gas Industry progress.

Dividends for every gas utility

Gas utilities are making the GEM advertising program even more effective by using GEM promotional materials.

Free ad mats are available for publishing these advertisements in local newspapers.

Free reprints of these advertisements enhance direct mail campaigns.

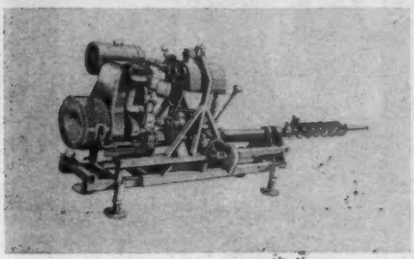
Published as a Service to the Gas Industry

AMERICAN®
METER COMPANY
INCORPORATED (ESTABLISHED 1836)

Product Previews

FOR THE GAS DISTRIBUTION INDUSTRY

For more information on items described here in brief, use the handy reply card and circle the corresponding numbers



Unique New Boring Unit. New self-powered, self-contained auger to bore holes for 2 through 10-in. pipe features fingertip controlled hydraulic power. Unique rotary hydraulic pump develops 275 psi for a 2½ in. cylinder that feeds and retracts the auger drive. Unit can be positioned in a small bell hole (40 by 108 in., 16 in. deeper than the center line of hole to be bored) and anchored, ready for boring within a few minutes. Pitch of hole can be governed by raising or lowering adjustable leg supports on the unit. Weighs only 600 lb uncrated and can be easily transported in pickup truck. *Moorlane Company.*

CIRCLE (16) ON THE REPLY CARD

Ultrasonic Cleaning Equipment. Blackstone Corporation has introduced ultrasonic cleaning equipment for the precision cleaning of parts and assemblies. Latest model GW-6 features double stainless steel tanks for ultrasonic cleaning and rinsing with continuous circulation and filtering of solution to remove all particles of 2 to 5 micron size or larger. Each tank is activated by multi-element magnetostrictive transducers operating at approximately 20 kc per sec. *The Blackstone Corporation.*

CIRCLE (17) ON THE REPLY CARD

New Detergents for Ultrasonic Cleaning. Narda Ultrasonics Corporation has developed a new water-wash detergent and new degreasing solvent for use in ultrasonic cleaning equipment. BLAST 1 is used as an additive to water baths, and BLAST 2 is used as a degreasing bath. A blend of anionic and non-ionic detergents, sodium silicate, and sodium polyphosphate, BLAST 1 is odorless, nonflammable, and safe for use on all surfaces; promotes cavitation and reduces surface tension. Is recommended for ultrasonic cleaning of mechanical, electrical, electronic, castings, and other parts and assemblies which can be cleaned in aqueous solutions. BLAST 2 is a solvent of the inhibited trichlorethane type is least toxic of all chlorinated hydrocarbon solvents. *Narda Ultrasonics Corporation*

CIRCLE (18) ON THE REPLY CARD

Trencher Attachment. Massey-Ferguson has added another to the list of power-matched attachments for the Work Bull 202 industrial tractor. Auburn Gear-

Draulic Trencher digs up to 600 to 800 ft an hour, compensates automatically for varying ground conditions, and handles trenches up to 6 ft deep in 6, 8, 10, 12, and 14-in. widths. Attachment can dig straight down from starting position, or back-trench underneath sidewalks, streets, and other obstructions. *Massey Ferguson Industrial Division.*

CIRCLE (19) ON THE REPLY CARD

Double Acting Motor Valve. Kimray's new 125 psi WP, series "DA," motor valve is spring loaded to close against approximately 6 psi upstream pressure. Pressure may be applied to either or both sides of the diaphragm. Valve has a single soft seat, full line opening to insure tight shutoff. Series includes valves from ¾ through 6-in. pipe sizes. *Kimray, Inc.*

CIRCLE (20) ON THE REPLY CARD

LARGEST STEEL GAS MAIN

Williams Brothers Company speeded up installation of the line with easy, economical Dresser® Couplings

Sure, the original specifications called for a number of Dresser Couplings, especially in the tough spots. But, the significant fact is that *after* further investigation of the expansion and contraction problem, the design was changed and Dresser Couplings were used where welded joints had originally been planned. Even with their welding equipment already in the field, Williams Brothers Co. found Dresser Couplings radically increased speed of installation.

You, too, will find Dresser Couplings the ideal joiner for your projected gas line . . . no matter what its size. Two man-minutes per bolt make every Dresser Coupling a permanent, gas-tight joint. And non-rigid Dresser Couplings absorb ground stresses and vibration, take up to 6° pipe deflection at each joint. Straight pipe takes long curves, goes over and around natural grade. Weather delays are cut to the minimum; when your men can get in the trench, they can make a joint that will last the life of the line . . . every time, with Dresser Couplings.

DRESSER MANUFACTURING DIVISION

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FROM WELL TO FLAME . . . A COUPLING OR FITTING FOR EVERY NEED

Free Circular Slide Rule. General Industrial Company is offering a circular slide rule free to engineers and other plant executives who need to perform simple calculations. Operation of the rule is simple and results are accurate. Aids in multiplying, dividing, and finding proportions. Instructions are included with each slide rule. For those not qualifying as an engineer or business executive for free slide rule, General Industrial will send one for 50 cents. *General Industrial Comany.*

CIRCLE (21) ON THE REPLY CARD

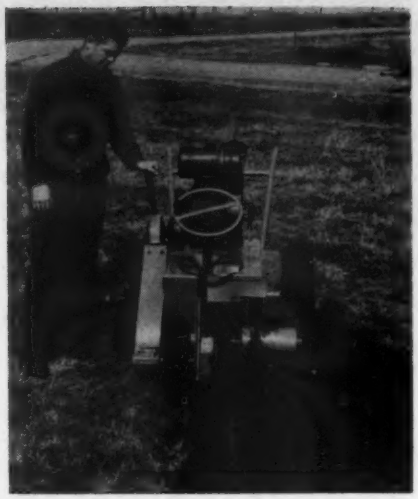
Punched Card Input Unit for Computers. ElectroData has developed a punched card input unit for the Burroughs E101 electronic computer. The new unit permits separate or intermixed data and instructions to be read into the desk-size digital computer from information in punched cards. The unit is cable-connected to the Burrough E101 for simplified removal and hook-up, and is used in conjunction with modified versions of standard card keypunches. Positioning an automatic-to-manual switch allows the operator to choose whether data or instructions will be read directly from punched cards, or taken from the keypunch's keyboard. Instructions entered manually from the keypunch can be simultaneously punched into cards, allowing the programmer to prepare his program deck as he tests out the instructions. *Burroughs Corporation, ElectroData Division.*

CIRCLE (22) ON THE REPLY CARD

Radio Research Device. General Electric is field-testing a power control unit for two-way radio systems that may eventually help reduce some of the communication industry's interference problems. Unit automatically adjusts transmitter power of a base station to match the incoming signal of a mobile radio. Less transmitted power means less co-channel interference. First tests of the device have been conducted at the Syracuse headquarters of the Niagara Mohawk Power Corporation. The new power control unit, developed by N. H. Shepherd of G-E's advance engineering section, was inserted to Niagara's base station, several years old, as a test to see whether it would reduce interference problems. *General Electric Company.*

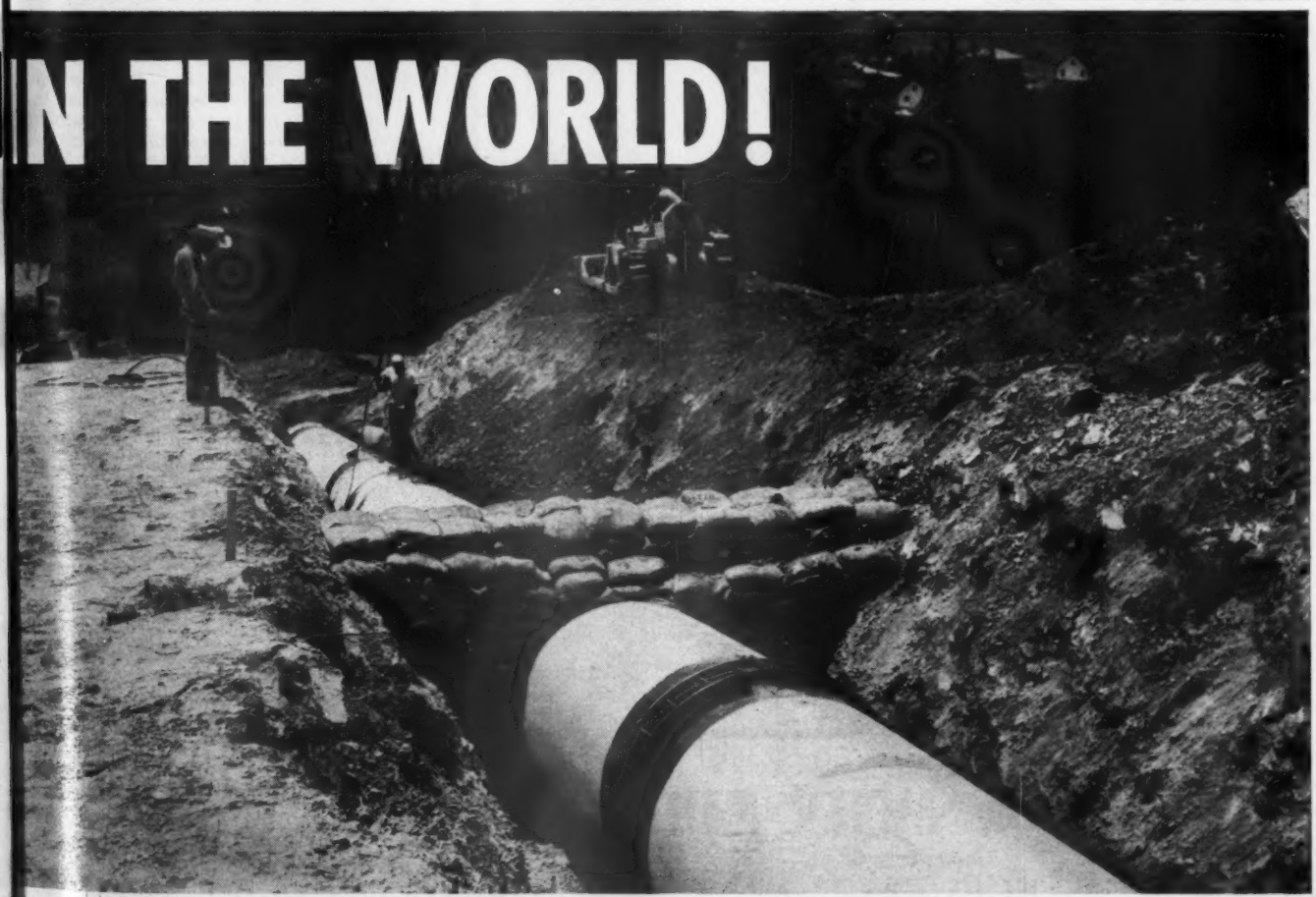
CIRCLE (23) ON THE REPLY CARD

Despite what you may have heard, Alcatraz is still the only pen with a lifetime guarantee.



Trencher. Charles Machine Works' new 1958 model M-2 Ditch Witch trencher features a new 8-in. width trencher to 30-in. depth, also a 6 by 36-in., 4½ by 36-in. and a 3 by 48-in. New speed reduction unit with "Select-O-Matic" shift from digging speed to mobile speed provides four speeds forward and reverse. A sod cutting attachment is among the new optional features available. This attachment can be mounted on the trencher in minutes, cuts an 8-in. sod strip at speed up to 40 ft per min. After trenching and backfilling, sod can be replaced, leaving turf with an "untouched" look. *The Charles Machine Works.*

CIRCLE (24) ON THE REPLY CARD

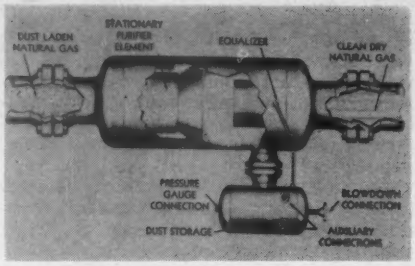


7½-mile Carnegie Natural Gas Co. twin line has a 54½-inch I.D.—a capacity of 255-million cubic feet of gas per day. The colossal gas line service the Clairton, Irvin, Duquesne, National Tube, J. Edgar Thompson Works and Homestead Works of U.S. Steel Corp. in the Pittsburgh area.

Product Previews

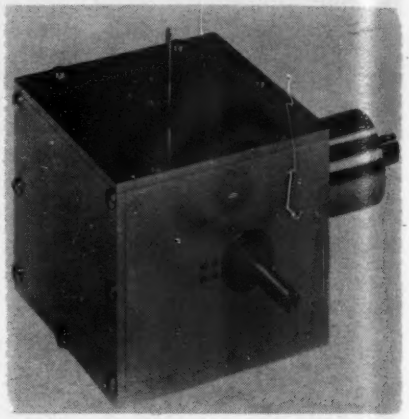
Throttling Valve. New large, high-pressure throttling valve for general industrial and chemical use is now being manufactured by Shaffer Tool Works, a pioneer oil tool firm. Features include outside threads to provide corrosion resistance; stem that may be locked at any setting, pointer and calibration plate to indicate amount of orifice opening, and tapered throat that gives a venturi tube effect with excellent flow characteristics. Valve is available in ASA or API flanged or threaded connections, made in carbon steel, stainless steel, bronze, or aluminum, in sizes from 1 to 6-in., and in pressure ratings up to 10,000 psi in all sizes. Automatic actuation by hydraulic or air pressure available for all valves. *Shaffer Tool Works.*

CIRCLE (25) ON THE REPLY CARD



Dust Scrubber. New type LD Hi-eF Scrubber offers maintenance-free dust scrubbing of natural gas for distribution systems. Unit, which can remove dust particles down to 10 microns in size, eliminates employment of filters or screens of any type to accomplish separation. This is achieved by controlling flow of natural gas against an impingement baffle and through a purifier element that imparts to the stream an extremely rapid, centrifugal movement, which in turn draws dirt and other entrainment to the walls of the chamber. Then, it is carefully directed into a storage reservoir to be blown down periodically to atmosphere. Hi-eF Type LD scrubbers are recommended to protect compressors, valves, meters, pressure regulators as well as for general gas purity purposes. Suitable for pressures up to 1000 psig. Inlet and outlet pipeline sizes range from 2½ through 36-in. *The V. D. Anderson Company.*

CIRCLE (26) ON THE REPLY CARD



Ring Integrator. American Meter has announced a new American Ring Integrator that is a precision variable speed mechanism employing a movable ring held between a driving disc and a driven drum. The movable ring can be accurately controlled or repositioned by a force of less than 0.02 oz as the output shaft load varies from zero to 2 oz.-in. Output shaft speeds of zero to 2.75 times the input speed can be obtained. Device can be used as an integrator or precision variable speed drive for instrumentation and control applications including chart drives, Btu meters, rate generators, servomechanisms, computers, tachometers, and telemetering system. *American Meter Company.*

CIRCLE (27) ON THE REPLY CARD

Shock-Absorbing Breaker Handle. Le Roi now has available a medium weight breaker with a shock-absorbing handle. The new handle is an adaptation of the shock-absorbing handles introduced last year on Le Roi's line of sinker drills. It is designed to absorb recoil and vibration, and yet delivers the same impact power as the former C11 model. Approximately 65 percent of the shock and recoil are absorbed by the new 6B75 breaker handle. *Le Roi Division, Westinghouse Air Brake Company.*

CIRCLE (28) ON THE REPLY CARD

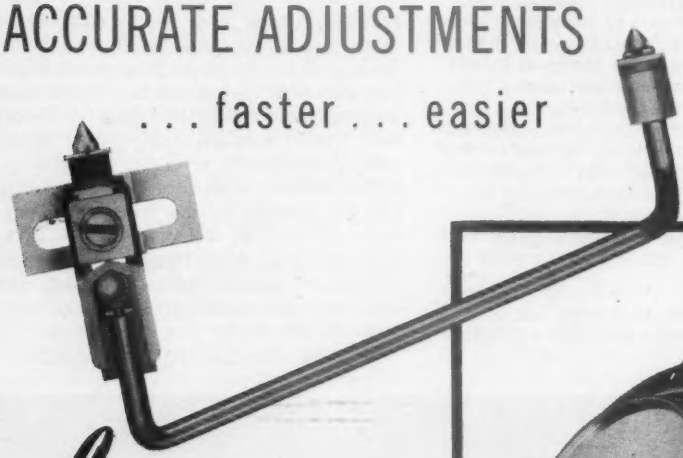
Brazing Alloy. A new brazing alloy to replace silver solder has been announced by American Brazing Alloys Company. The alloy does not require flux on copper to copper joints. A joint brazed with No. 211 is stronger than the parent metal. This general purpose alloy may be used on copper, brass, and bronze. It is an extremely ductile rod, adaptable in all phases of maintenance work, in construction, air conditioning, heating and plumbing industries. *American Brazing Alloys Company.*

CIRCLE (29) ON THE REPLY CARD

Built-in Carrier Wire Assembly Makes

ACCURATE ADJUSTMENTS

. . . faster . . . easier



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for 1-A sprague gas meters

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For Proper Meter Care Use
These Lancaster Quality Products

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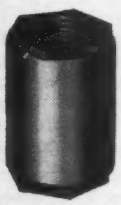

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SOLDER AND FLARE COPPER UNIONS

Copper and Iron Pipe joined safely with MAYCO dielectric fittings

Copper and iron, brass and iron or other dissimilar metals are safely connected *with no electrolysis* when you use MAYCO dielectric couplings and unions. The cost is low enough to use them on every job—the tough nylon bushing insulates completely . . . withstands temperatures up to 230° F. and pressures up to 1000 lbs. Order now.

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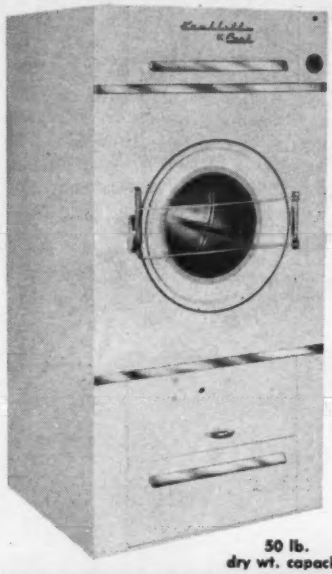
37x30 GAS HEATED TUMBLER

MAKES OTHER DRYERS OBSOLETE!

• ADVANCED ENGINEERING • QUALITY MATERIALS
• SIMPLIFIED CONTROLS • LOW COST OPERATION



50 lb. dry wt. capacity

Exclusive!

TUMBLETTE FEATURES!

- Dodge Friction-Free Power Transmission with 2 YEAR WARRANTY
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- Fiber Glass Insulation, locks on access openings.
- COINETTE flush-mounted meters and timer models available.
- New non-clog 100% safety pilot light.

Write for full information and FREE brochures.

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THE *FINEST* FOR MODERN GAS DISTRIBUTION SERVICE

NORMAC

Insulating **Fittings**

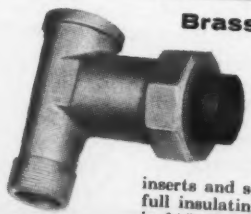
Malleable Service Ell

The insulating principle depicted above is carried out in all Normac Ells and Tees.

Malleable Couplings

Normac Insulating Malleable Couplings and fittings are available with polyethylene inserts and semi-insulating gaskets or full insulating rubber gaskets.

Brass Fittings



Normac insulating Brass compression end Tees, Ells and all compression end fittings are available with polyethylene inserts and semi-insulating or full insulating rubber gaskets in ¾", 1" and 1¼" iron pipe sizes.

New CATALOG

Write for your copy . . . it gives complete details and specifications of NORMAC equipment.

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Couplings • Meter Bars • Sleeves • Cocks
Bell Joint Clamps • Service Tees and Ells

BOOKSHELF

Appraisal and Valuation Manual, *Volume Three, published by the American Society of Appraisers, 369 Lexington Avenue, Suite 1105, New York 19, New York. Pages, 500. Price, $15.00.*

New source book of latest authoritative information on the solution of appraisal and valuation problems encountered in business and government, contains more than 40 new, hitherto unpublished technical studies, all prepared by top-ranking professional experts in the appraisal and valuation field. Studies in the manual comprise a wide range of topics related to every phase of valuation and appraisal in all branches of real estate, architecture, building construction, public works, engineering, insurance, accounting, law, taxes, assessments, banking and finance, public utilities, industry, plus every facet of government. Among important new contributions are studies entitled: "Appraisal of Utility Property for a Prospective Purchaser," "Depreciation for Public Utilities," "Valuation in Condemnation — Partial Taking," etc.

Plant Design and Economics for Chemical Engineers, *by Max S. Peters, published by McGraw-Hill Book Company, 330 West 42nd Street, New York 36, New York. Pages, 511. Price, $11.00.*

Newest addition to the McGraw-Hill series in chemical engineering, includes recent advances and special topics such as cost data and cost correlations, applying to January 1, 1957, recent tax laws, new governmental regulations for determining depreciation charges. Capitalized-cost concept and the sum-of-the-years digits method for evaluating depreciation charges and recent correlations and methods for designing heat-transfer, materials-transfer, and mass-transfer equipment are also included. First part of the book deals with applied economics, particularly in the process industries and in design work. The remainder of the book deals with methods and important factors in design of plants and equipment. Generalized subjects, such as waste disposal, structural design, and equipment fabrication, are included along with design methods for different types of process equipment. Basic cost data and cost correlations are also presented for use in making cost estimates.

Applied Mathematics for Engineers and Physicists, *2nd ed., by Louis A. Pipes, published by McGraw-Hill Book Company, 330 West 42nd Street, New York 36, New York. Pages, 723. Price, $8.75.*

Revised edition gives engineer and applied physicist the principal mathematical techniques they need to analyze the usual mathematical problems that arise in practice and to understand important current technical papers. Book covers those subjects that are essential for the understanding of present-day engineering analysis, such as: Infinite series, complex numbers, and the complex transform theory, vector and tensor analysis, partial differential equations, modern algebraic methods including matrices, integral equations, the calculus of variations, and ordinary nonlinear differential equations. Entirely new section on tensor analysis has been added to the chapter on vector analysis. Book features an unusually complete treatment of matrices, with additional material on the inversion of large matrices being included and an entire section on matrix algebra rewritten to incorporate the many new techniques involving applications of matrices to problems in engineering and physics that have developed in the past ten years.

Natural Gas for Low Cost Commercial and Industrial Air Conditioning, *prepared by Donald M. Mayne. Available from the Southern Gas Association, 1525 Life of America Building, Dallas, Texas. Pages, 50. Price, $2.00.*

Manual presents concise information on products and systems powered by natural gas for large tonnage air conditioning. Prepared as a single reference source to help architects and mechanical engineers evaluate advantages of using economical natural gas energy for air conditioning. Two-color manual is profusely illustrated with charts, equipment specifications, and installation photographs. Lists advantages of various existent systems including: Absorption refrigeration systems; natural gas engine driven compressor units; steam turbine driven centrifugal compressors; absorption centrifugal combination systems; dehumidification units; steam jet; and turbine drive pumps. Special section deals specifically with equipment application and performance, data sheets, examples of installations, as well as a directory of large commercial and industrial installations.

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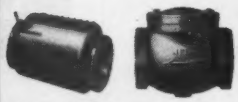

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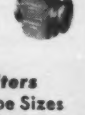

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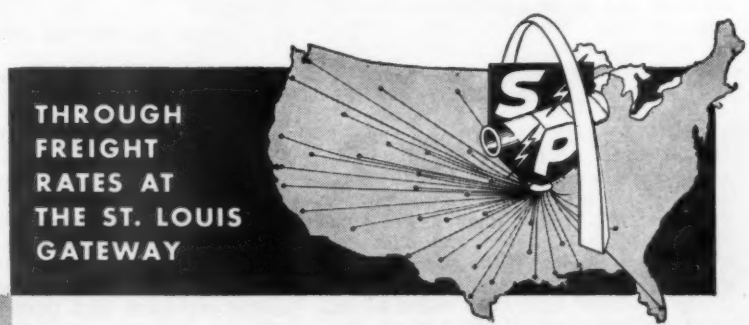

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Bulletin Board

NEW BOOKS...BROCHURES...CATALOGS

For more information on items described here in brief, use the handy reply card and circle the corresponding numbers

Industrial Valves. New condensed version of Ohio Injector's general catalog listing its line of industrial valves is now available. Catalog lists over 95 percent of the line, condensed into a 28-page form. Valve figure numbers are indexed for finger-tip reference by topics; face to face dimensions are supplied in full size ranges. Listed for the first time is a section on bronze brazed joint valves as well as the corrosion resistant nickel-iron line. A forged and cast steel section has been developed showing valve trim designations and pressure temperature charts with ratings to latest ASA specs. *The Ohio Injector Company.*

CIRCLE (73) ON THE REPLY CARD

Gas Pumps. New revised bulletin covering Roots-Connersville's Type XA rotary positive gas pumps has been issued. Available in 18 sizes, these pumps offer a wide range of capacities, pressures, and drives. Technical rating data is clearly presented along with detailed design and construction data to aid the engineer in proper selection and application of equipment. *Roots-Connersville Blower, Division of Dresser Industries, Inc.*

CIRCLE (74) ON THE REPLY CARD

Concrete Cutting Lance. New 4-page folder describes revolutionary new tool capable of slicing through concrete or metal of any thickness. Accurate control of intense heat is key to operation of new lance, developed by Linde Company. Booklet outlines origin, principle, and scope of the powder-lancing process and describes cost saving applications on construction jobs. Complete specifications are included. *Linde Company, Division of Union Carbide Corporation.*

CIRCLE (75) ON THE REPLY CARD

Service Regulators. New 20-page revised bulletin covers Rockwell's line of service regulators. Two-color, photo-illustrated bulletin describes for the first time all three Rockwell service regulators — 107, 143, and 173 — designed and built for domestic gas service. Three pages of data on the 143, a light-weight internal-relief service regulator, have been added to the bulletin. Cross-sectional views of all regulators and outlet pressure adjustment range, capacity, and dimension tables are also included. *Meter and Valve Division, Rockwell Manufacturing Company.*

CIRCLE (76) ON THE REPLY CARD

Low Pressure Gas Regulators. Specifications and performance data for low pressure gas regulators for commercial and industrial heating equipment are available in a new 6-page two-color bulletin. Pressure drop and capacity chart; pressure drop graph; typical performance curves; complete performance, operating limits and construction data on "Straight-Thru-Flow" gas regulators are included. *Maxitrol Company.*

CIRCLE (77) ON THE REPLY CARD

In-Place Cement Lining of Pipe. New catalog describes process of in-place centrifugal cement lining of 4 to 144-in. pipe. Featured in the 20-page catalog is a new machine that centrifugally lines pipe as small as 4-in., and requires no excavation at laterals. Development of the process is charted and advantages illustrated. Sample specifications, test results, and case histories of unusual public and industrial projects are included. *Centriline Corporation, subsidiary of Raymond International Inc.*

CIRCLE (78) ON THE REPLY CARD

Gas Processing Machines. New 24-page bulletin describes Buflovak's processing equipment for chemicals, food products, and by-product recovery. From research to engineering and manufacturing, bulletin illustrates company's production facilities, and the variety of processing machines and vessels produced for industry. Specification tables and design data are given for gas cleaners, recompression boosters, all types of dryers, evaporators and concentrators, flakers and cooling drums, autoclaves, mixers, kettles, and special equipment. *Buflovak Equipment Division, Blaw-Knox Company.*

CIRCLE (79) ON THE REPLY CARD

Utility Tractors. Pictorial review of Allis Chalmers' D-Series utility tractor line is now available in a three-fold catalog. Photographs show the various approved attachments for the D-Series in action. Engineering, design, and construction features of the tractors that combine with companion equipment to provide new power and performance for industrial and utility jobs are also pictured. Catalog includes specifications and dimensions of both the D-14 and D-17 tractors. *Allis-Chalmers Manufacturing Company.*

CIRCLE (80) ON THE REPLY CARD

To Improve Efficiency. New booklet analyzes various areas of office operation and outlines suggestions for making improvements. "100 Ways to Improve Efficiency — Save Money in Your Office," compiled by Manpower, Inc., considers various office expenses entailed in the operation of a business and points out proper planning procedures to effect improvements. Proper planning of office work, budgets, physical office, storage, forms, selection and promotion of employees, training employees and supervisors, office equipment, mail department, telephone service, filing and record retention, and other office methods are discussed. *Manpower, Inc.*

CIRCLE (81) ON THE REPLY CARD

Conversion Gas Burners. New 6-page illustrated folder describes Timken's conversion gas burners for residential furnaces and steam or hot water boilers (either square or round). Dimensional drawings, cutaway views, specifications, ratings, and text on design and installation features are included. Burners are adaptable for natural, mixed, manufactured, and bottled gases. Models range in input ratings from 50,000 Btu to 300,000 Btu per hour. *Timken Silent Automatic Products.*

CIRCLE (82) ON THE REPLY CARD

Data Processing. New 6-page bulletin describes Beckman's Model 210 Data Processing System. Detailed information on the operation, construction, and features of the 210 System are included. The 210 System is capable of receiving up to 1000 input signals at high speed, converting the signals to digits, and putting the information on magnetic tape in a format suitable for any computer. *Beckman Systems Division.*

CIRCLE (83) ON THE REPLY CARD

Industrial Controls. New catalog from Minneapolis Honeywell describes over 9000 controls for temperature, pressure, humidity, and other variables. Selection of final control elements and accessories is included as well as pneumatic, electric, and electronic devices for control, switching or safety functions. *Brown Instruments Division, Minneapolis Honeywell Regulator Company.*

CIRCLE (84) ON THE REPLY CARD

Full-Encirclement Saddle. Dimensional data, cyclic life, and correct welding procedures for Tube-Turn's "Full-Encirclement Saddle" are detailed in new bulletin. Widely used in gas industry where "hot taps" are frequently required, the full-encirclement saddle provides a 360 deg. reinforcement of pipe and is split longitudinally. Bulletin includes a chart of relative life of branch connections, showing cyclic life of saddle 11 times greater than ordinary saddles and over 100 times greater than unreinforced branch connections. Two important dimensional changes — expansion of size range to include full size outlets for sizes up to 24-in. and "center to end" dimensions to equal OD of run pipe — are reported. Saddles are available for use with nominal pipe sizes 6-through 26-in. *Tube Turns.*

CIRCLE (85) ON THE REPLY CARD